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Essex County Council

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Jacobs U.K. Limited

5 First Street
Manchester
M15 4GU
0161 2356000

www.jacobs.com

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1. Introduction

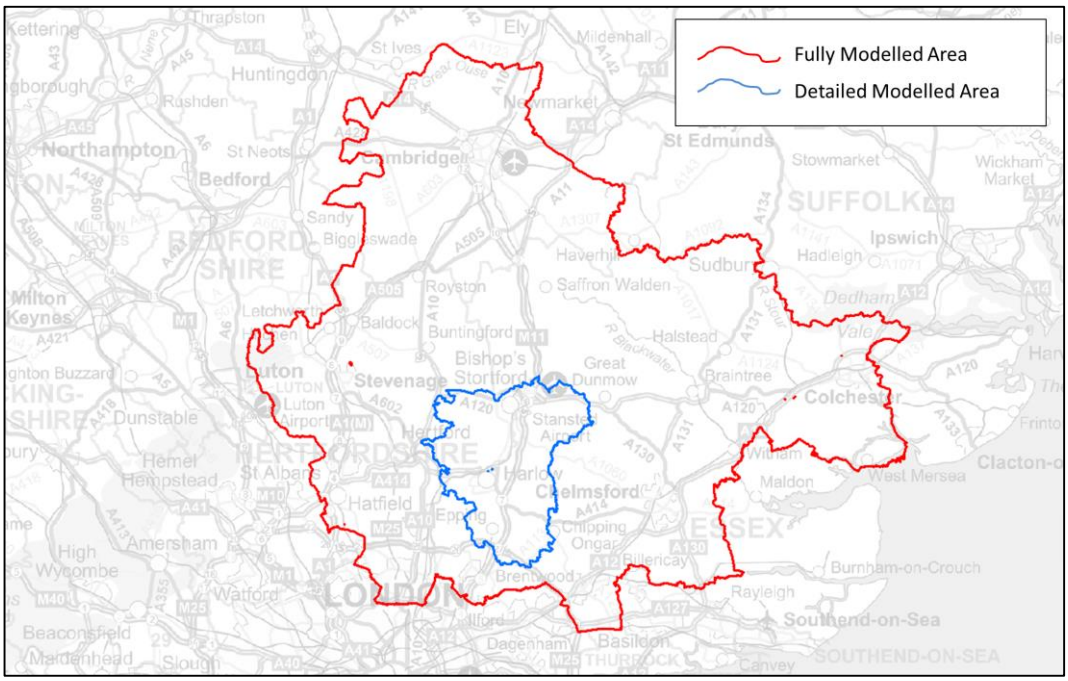
1.1 Model Background

1.1.1 Jacobs was commissioned in June 2014 by Essex County Council (ECC) to construct a strategic traffic model of Harlow and its surrounding area. The primary objective of the model development was to assess the effect on traffic of the highway options for an additional access to Harlow from the Strategic Road Network (SRN) and to inform a full business case submission.

1.1.2 The model was to be constructed following the latest DfT Highway Assignment Modelling Guidance. The demand data used in the model is a mixture of observed and synthetic data. The area of mobile phone data collection is equivalent to the fully modelled area, shown below in Traffic counts within the same broad area of influence have been used for the purposes of calibration and validation.

1.1.3 Figure 1.1. Traffic counts within the same broad area of influence have been used for the purposes of calibration and validation.

Figure 1.1 : Area of Model Coverage



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1.1.4 The detailed modelled area is that within which the model is most detailed and the majority of junctions are explicitly modelled. The fully modelled area does not have the same level of modelled detail; however traffic counts have been used in these areas to ensure that traffic flows entering and leaving the area are representative of 2014 traffic conditions.

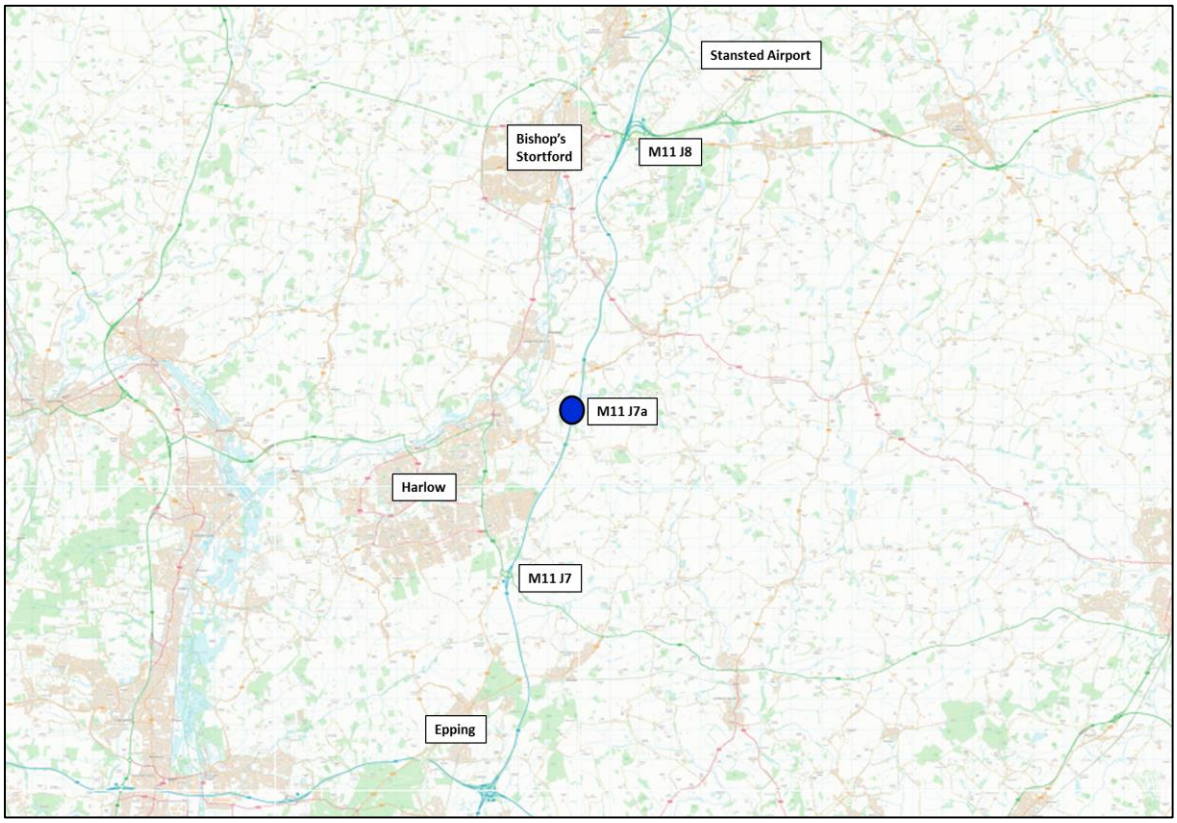
1.1.5 Journey time surveys have utilised Trafficmaster data and also cover the entire fully modelled area.

1.1.6 The model is a highway only model. It models three peak hour time periods (AM, Inter peak and PM) with vehicles being classified into cars, light goods vehicles and heavy goods vehicles. Cars were further divided into three separate trip purposes (commute, business and other) in keeping with guidance and allowing the model outputs to be used for Value for Money and Economic Assessments.

1.2 Scheme Background

1.2.1 As shown by Figure 1.2 below Harlow has only one connection to the SRN on the M11, via Junction 7 (J7), which is located to the south and east of the town. With high levels of traffic needing to access this one junction, as well as pass through it on the A414, congestion is common with impacts, even from minor incidents, often causing severe congestion across the town's wider road network. This is exacerbated by the location of the existing key employment areas, towards the north and west of the town (Edinburgh Way and Pinnacles), which creates further strain on the current local road network, particularly along the A414.

Figure 1.2 : Location of the proposed M11 J7a



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1.2.2 Preliminary evaluation work for Uttlesford District Council's next Local Plan to 2031 has also highlighted concerns for M11 Junction 8 (J8), with committed and planned growth from Stansted Airport, East Herts and Uttlesford likely to result in additional peak period pressure at this junction.

1.2.3 ECC is seeking to further develop the evidence base supporting a range of future transport schemes and investments across the county. The evidence should also be able to support future and continued engagement with central government and the South East Local Enterprise Partnership (SELEP), be amenable to future scheme changes, and be capable of supporting the evidence pathway for major scheme business case development as part of the next steps of any funding bid.

1.2.4 As a result of the problems outlined above ECC has been considering options to alleviate congestion around J7 and J8. A proposed Junction 7a (J7a) to the east of Harlow will help to mitigate against these problems with the following specific objectives:

- To improve accessibility to and from Harlow;
- To reduce congestion primarily for the A414 corridor;

- To provide infrastructure of an appropriate scale for future traffic demands; and
- To facilitate future housing developments and employment growth within and around Harlow.

1.2.5 The emerging Harlow Local Development Plan highlights that the inability of the existing transport system is the biggest single barrier to accommodating the level of growth needed in Harlow. M11 J7 is operating close to its planned capacity, which is recognised by Highways England (HE) as they required a cap on the number of new jobs permitted within the Harlow Enterprise Zone until network capacity issues are addressed.

1.3 Purpose of the Report

1.3.1 This report provides a detailed summary of highway surveys undertaken for use in building the Harlow Transport Model. This includes information on the data collected and survey sites, as well as analysis of the data, which was received.

1.4 Structure of the Report

1.4.1 The structure of the remainder of this report is as follows:

- Chapter 2 – Existing Data
  - This chapter outlines the existing data used, including survey locations and dates.
- Chapter 3 – Survey Programme
  - This chapter outlines the traffic survey programme, including survey locations and dates.
- Chapter 4 – Mobile Phone Analysis
  - This chapter details analysis carried out to ensure the robustness of the mobile phone data.
- Chapter 5 – Automatic Traffic Count (ATC) and Manual Classified Count (MCC) Analysis
  - This chapter details the processed traffic count data collected for the model build.
- Chapter 6 – Journey Time Data Analysis
  - This chapter describes the processed journey time data collated for use in the traffic model build.
- Chapter 7 – Journey Time Delay
  - This chapter uses Trafficmaster data to display congestion plots for the fully detailed model area.
- Chapter 8 - Summary

2. Existing Data

2.1 Introduction

2.1.1 As highlighted in the Appraisal Specification Report[1] for the Harlow Transport Model, there were already a number of different sources available to provide the traffic count data needed to build the model:

- ECC's continuous Automatic Traffic Count (ATC) data collection programme;
- Hertfordshire County Council's continuous ATC data collection programme;
- HE's HATRIS ATC dataset; and
- historic temporary ATC and Manual Classified Count (MCC) sites.

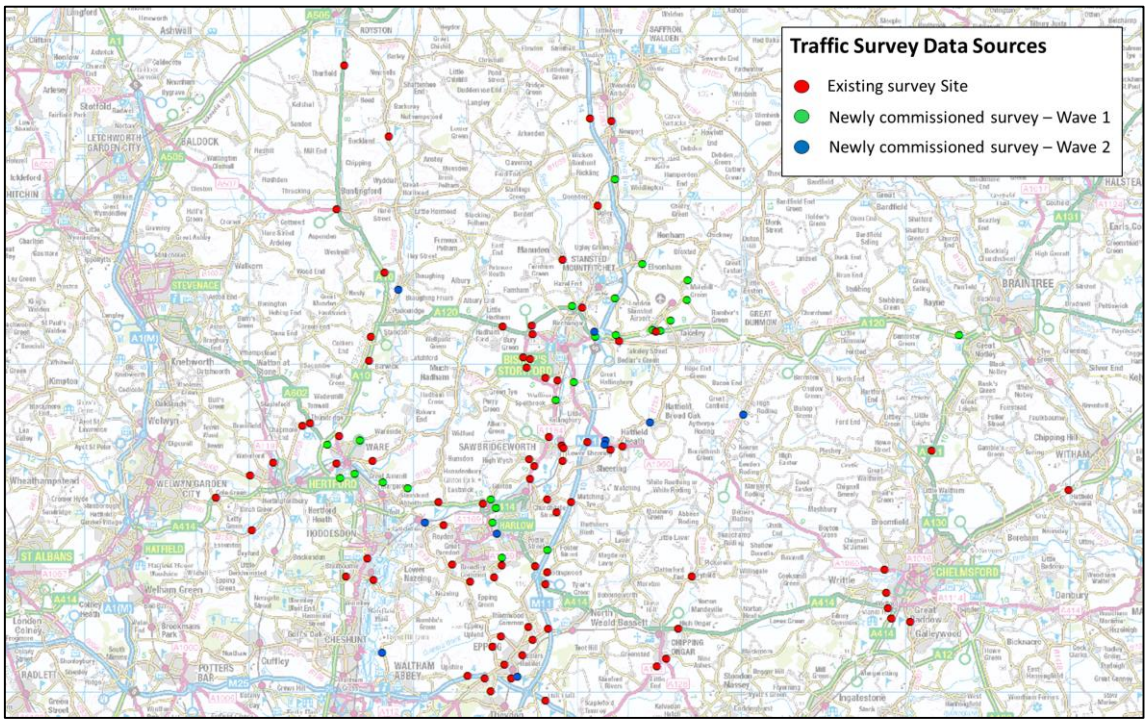
2.1.2 The locations of the sites where data was available from the previous 3 years (2011-2014 inclusive) were analysed, in particular to identify suitable calibration and validation screenlines for the model. A survey programme was then developed to collect data from locations for which traffic data was required and for which suitable data was not already available.

2.1.3 ECC also has access to the Department for Transport's (DfT's) Trafficmaster data. This provides a source of average journey time data across different time periods on links of the road network, which can be used for journey time validation of the model.

2.2 Automatic Traffic Counts (ATC)

2.2.1 **Error! Reference source not found.** displays the location of all ATC survey sites, with those that are newly commissioned and from existing sites clearly marked.

Figure 2.1 : ATC Traffic Count Sites



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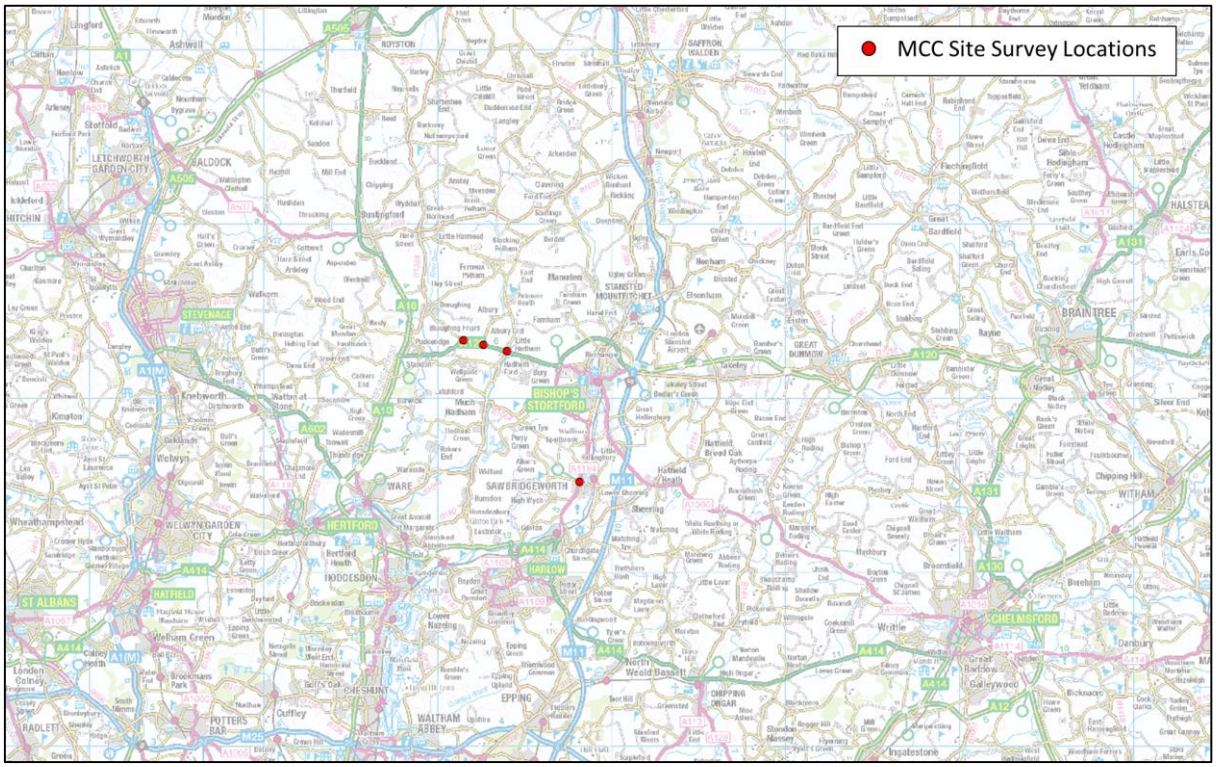
[1] Revision 2, February 2015

2.2.2 A full list of all count locations and the dates on which the data was collected that was used in the model calibration/validation process can be found in **Error! Reference source not found.**.

2.3 Manual Classified Counts (MCCs)

2.3.1 A small number of MCCs, four in total, were used in the calibration and validation processes. No new MCCs have been carried out as part of this model build; however data was already available from the following sites, shown in **Error! Reference source not found.**. These locations are all on roads with low flows and so, although MCC data from just one day will be fairly inaccurate, it was deemed accurate enough in this case to not undertaken control ATCs at these sites.

Figure 2.2 : MCC Traffic Count Sites



2.3.2 A full list of all count locations and the dates on which the data was collected that was used in the model calibration/validation process can be found in **Error! Reference source not found.**.

2.3.3 MCCs were also used to calculate a vehicle split classification, details on this process can be found in Section 5.5.

2.4 Journey Time Data

2.4.1 Trafficmaster data was received from the Department for Transport (DfT). The Trafficmaster database holds information collected from in-vehicle GPS (Global Positioning System) tracking devices. The GPS data are mapped to the Ordnance Surveys Integrated Transport Network (ITN) and are used to derive average speed and journey times.

2.4.2 The Trafficmaster data extracted included weekdays in June 2013 for Cars and LGVs (up to 3500kg). This month was used to be consistent with the other survey data and, at the time, 2013 was the most recent year available.

2.4.3 The journey time data was collated to form the journey time routes and sections specified for the Harlow Transport Model validation process. Each journey time route was subdivided into a number of timing points located at key points along the route.

2.4.4 The routes along which journey time data was collated are listed below in Table 2.1 and are illustrated in **Error! Reference source not found.**.

Table 2.1: Journey Time Survey Routes

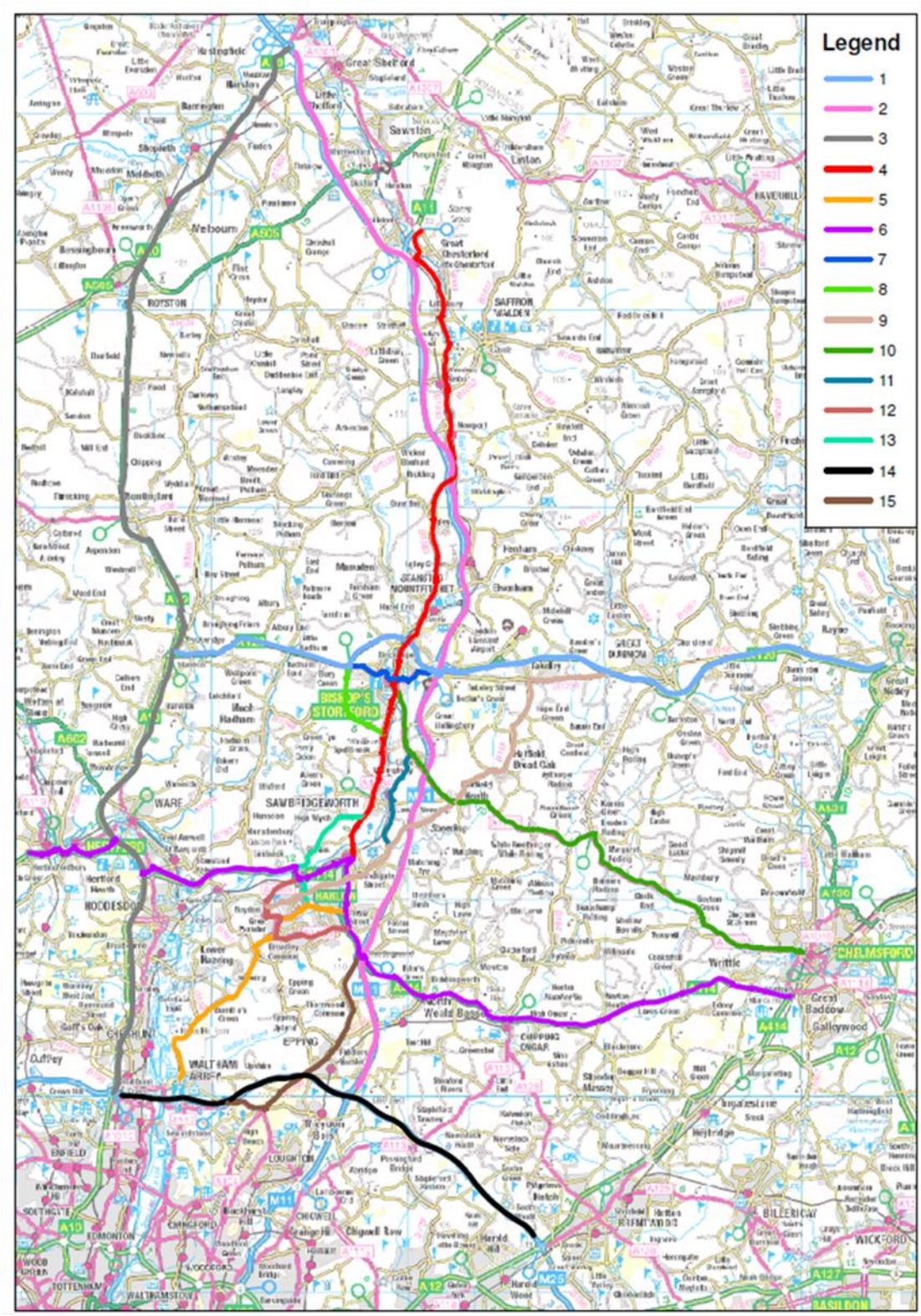
No	Description	Directions	Method	Minimum Sample Size
1	A120 Puckeridge to A131 Braintree	EB & WB	TrafficMaster	132
2	M11 J6 (M25) to J11 (A10) Trumpington	NB & SB	TrafficMaster	329
3	A10 from M25 J25 Waltham Cross to M11 J11 Trumpington	NB & SB	TrafficMaster	51
4	B1383 (Gt Chesterford) and A1184 (Harlow Mill) (old A11 N)	NB & SB	TrafficMaster	34
5	Harlow to Waltham Abbey via Crooked Mile Route (B1133, B194)	NB & SB	TrafficMaster	38
6	A414 from west of Hertford to Chelmsford	EB & WB	TrafficMaster	108
7	A1250 through Bishop's Stortford (A120 to A1184/A120)	EB & WB	TrafficMaster	18
8	A1184 Bishop's Stortford south-west By-pass from A120 to B1383	NB & SB	TrafficMaster	25
9	B1256 from A120 through Takeley then B183 to Pinnacles Harlow via Hatfield Heath and Sheering and 1st/4th Ave	EB & WB	TrafficMaster	18
10	A1060 from A1016 Parkway (Chelmsford) to B1383 (Bishop's Stortford)	EB & WB	TrafficMaster	33
11	Sawbridgeworth Road, Hallingbury Road, Sheering Lower Road	NB & SB	TrafficMaster	7
12	A1169 Southern Way, Katherine's Way, A1169 Elizabeth Way (A414 to A414)	ACW & CW	TrafficMaster	47
13	High Wych Road between A1184 and A414	NB & SB	TrafficMaster	57
14	M25 J25 Waltham Cross to J28 Brentwood	ACW & CW	TrafficMaster	756
15	B1393 / A121 Hastingwood to Waltham Abbey (old A11 S)	EB & WB	TrafficMaster	117

2.4.5 The minimum sample size of Trafficmaster data for an individual ITN link is shown in Table 2.1. In the process of mapping the GPS data to the ITN a minimal number of shorter links (less than 100m) can be mapped incorrectly and have therefore not been shown in Table 2.1. The journey times along these short links are such that the accuracy of the overall route journey time is not affected.

2.4.6 By using data taken from Trafficmaster, it has not been possible to determine the accuracy of the journey time information as set out in the COBA manual[2]. Nevertheless, the Design Manual for Roads and Bridges states that journey times along a particular route should be accepted if a level of accuracy has not been achieved after 12 runs. Whilst route 11 has a minimum sample size of 7 it should be noted that just 12 data points out of 114 are below the 12 sample threshold. Therefore, given the number of journey time runs achieved through the use of Trafficmaster, this should be considered a robust sample.

[2] http://webarchive.nationalarchives.gov.uk/20100304070241/http://www.dft.gov.uk/pgr/economics/software/coba11usermanual/part5speedsonlinks.pdf, Chapter 11.

Figure 2.3 : Journey Routes



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2.4.7 Detailed maps of each journey time route and the location of individual timing points can be found in **Error! Reference source not found.**.

3. Survey Programme

3.1 Introduction

3.1.1 A survey programme was undertaken in the wider Harlow area during late June and July 2014 (wave 1) to support the development of a highway traffic model. Some additional traffic counts (wave 2) were later identified as being required and so these were undertaken in October 2014 and one in February 2015. The following surveys were undertaken and data collected:

- Anonymised mobile phone data; and
- additional Automatic Traffic Counts (ATC).

3.1.2 The following chapter describes each of the surveys and their purpose, including the locations and individual survey dates.

3.1.3 As stated in the Technical Note entitled "Supplementary Information on the Harlow Transport Model", February 2016, due to time constraints resulting from ECC's programme for the proposed M11 Junction 7a, mobile phone data was collected during the last week of June and the first weeks in July (24 June to 17 July 2014). Whilst July is considered a non-neutral month, the data was collected prior to the start of the school holidays and this timing was accepted by HE at the time. Where possible traffic count surveys were undertaken during the same period, so as to provide data consistent with the origin-destination data being used.

3.1.4 In the same technical note, a comparison was undertaken with 2015 annual ATC datasets and this concluded that there are small differences (of at most 4.7%) between data for the neutral period and the mobile phone collection period. Most 12 hour flows are within 2%, and a high proportion of the period specific values are also within this range. As the differences between the two groups are smaller than the margins of error in traffic count data, we conclude that there is no significant variation from neutral month values.

3.2 Events affecting traffic surveys

3.2.1 Events occurring in the main data collection period, which could have affected traffic conditions, are listed in Table 3.1 below.

Table 3.1 : List of events affecting traffic conditions in June & July 2014

Date	Event	Location	Start Time	End Time
25/06/2014	Serious Accident	Harlow - London Road A414	07:25	10:30
	Serious Incident	A414 North Orbital Road Eastbound	09:45	10:00
26/06/2014	Serious Accident	Harlow - First Avenue	17:30	18:45
01/07/2014	Critical Accident	M11 Southbound J8 - J7	14:15	16:55
	Critical Accident	Writtle/Little Oxney Green - A414	17:05	20:30
02/07/2014	Serious Accident	M11 Southbound J6 - J5	13:25	14:25
	Serious Incident	A119 Ware Road Junction with Mill	12:46	14:49
03/07/2014	Serious Incident	M25 J28 (A12)	06:00	08:20
	Serious Accident	A12 Northbound J27 - J28	08:45	
	Critical Accident	M11 J7 Harlow/A414 - J8 Stansted/A120	17:10	10:55
	Sonisphere	Stevenage - A1(M), A602, A1055 affected	09:00	09:00 (07/07 /14)
07/07/2014	Tour De France Day	Travelled from Cambridge to Epping via Saffron Waldon, Finchingfield, Wethersfield, Rayne, Felsted, and Chelmsford causing multiple road closures	07:30	

Date	Event	Location	Start Time	End Time
	Serious Accident	M25 anticlockwise J26-25	09:30	11:20
	Serious Accident	Stanford Rivers - School Road	17:05	18:20
	Serious Incident	A10 Southbound between B1001 Westmill Road and the A414 Hertford	18:27	19:00
08/07/2014	Serious Incident	B181 Roydon Road in Stanstead Abbots from the A414 Eastwick Road to the railway bridge at Briggers Park Road	11:08	10:17 (11/07/14)
	Serious Accident	A10 Southbound between A602 and A414 Rush Green Roundabout	15:39	16:48 (11/07/14)
09/07/2014	Serious Incident	King Street Junction with John Street Royston	09:31	10:35
10/07/2014	Critical Accident	M11 Southbound J7 - J6	15:35	
12/07/2014[3]	Cazfest	Sworders Field, Bishops Stortford		
14/07/2014	Serious Incident	A10 Southbound between Church Lane and the B198 College Road	07:33	17:13 (15/07/14)
15/07/2014	Serious Accident	A10 Hoddesdon to Turnford both directions	16:33	17:13
16/07/2014	Serious Incident	Cherry Tree Green Hertford	14:36	Ongoing
18/07/2014	Serious Accident	Chelmsford - A138/B1008	08:10	09:25
	Serious Accident	Beauchamp Roding - Dunmow Road (B184)	08:30	13:40
	Summer Fun Day	Hertford - Hartham Park		
19/07/2014[3]	Battle Proms	Hatfield - Hertford Road		
22/07/2014	Critical Accident	M25 anticlockwise J26 - J25	05:10	11:40
23/07/2014	Serious Incident	M25 Anticlockwise J28 - J27	13:00	01:00

3.2.2 Events occurring within Essex during the October 2014 and February 2015 data collection periods, which could have affected traffic conditions, are listed in Table 3.2 and Table 3.3 below. Unfortunately it has not been possible to obtain the equivalent information for events in Hertfordshire.

Table 3.2 : List of events affecting traffic conditions in October 2014

Date	Event	Location	Start Time	End Time
15/10/2014	Critical Accident	M25 J27, Junction with M11	10.40	19.45

Table 3.3 : List of events affecting traffic conditions in February 2015

Date	Event	Location	Start Time	End Time
03/02/2015	Traffic Accident	M25 anticlockwise J28 and J27	15.45	17.00
04/02/2015	Critical Incident	M25 anticlockwise J27 to J26	06.45	12.30

3.2.3 The combined impact of the above on average normal weekday model period flows across the model area is likely to be minimal.

[3] These dates are weekend dates, so not used for the traffic count data.

3.3 Mobile Phone Data

Reasons for using mobile phone data

3.3.1 WebTAG guidance unit M3.1 advocates the development of base year matrices from observed data, with emphasis made on the use of roadside interview (RSI) data. However, the use of roadside interviews is becoming increasing difficult and has known limitations listed below:

- Increasingly difficult to carry out RSI surveys – ECC will not allow this form of data collection on their roads;
- Suffer bias and cause significant delays;
- Traffic diverts from normal routes to avoid delays (awareness of surveys is possible through social media and local radio broadcasts);
- Household and RSI surveys are expensive;
- Do not provide route choice information;
- Only accurate at the RSI location; and
- RSI's not possible on dual carriageways or motorways.

3.3.2 The benefits of utilising mobile phone data rather than more traditional RSI data are as follows:

- Relatively unbiased data set;
- Much larger sample sizes than that of RSIs, i.e. typically 20% across an area-wide location, as opposed to 10% of key routes only when using RSIs;
- Can obtain detailed route choice through the network, which is key for option appraisal and scheme testing;
- Can include all road types including those where RSIs are not normally permitted i.e. motorways/ heavily trafficked locations;
- Provides mode split through derivation from travel patterns;
- Allows full trip tours to be built; and,
- Can obtain trip travel time matrices by mode.

3.3.3 Based on the above reasons, and through Jacobs' involvement in the development of approved methodologies in developing sound observed matrices, aggregated mobile phone data has been collected for the purposes of matrix development.

Overview of data

3.3.4 Mobile phone signal data was processed by INRIX and observed origin-destination trip matrices were produced and provided to Jacobs. The data was obtained from Telefonica, a supplier of anonymised phone data from O2 subscribers. O2 has the largest market share of mobile operators in the UK with a 22.4% share of the market, providing a robust sample of traffic movements within the study area[4].

3.3.5 Anonymised data was collected between 24th June and 17th July 2014. To be representative of mid-week travel, only data for each Tuesday–Thursday in the four week period were used in the derivation of demand matrices. As such there were a total of twelve days of data collected.

3.3.6 Data was collated across the entire 24 hour period for each day, however final trip matrices received by Jacobs were only for the three modelled time periods, as follows:

[4] http://www.statista.com/statistics/375986/market-share-held-by-mobile-phone-operators-united-kingdom-uk (Last Accessed: 19/08/2015)

- AM peak hour: 0800-0900;
- Interpeak hour: 1100-1200; and
- PM peak hour: 1700-1800.

3.3.7 The area of mobile phone data collection is equivalent to the fully modelled area, with only the trips passing through the detailed model area recorded. The extent of the detailed modelled area and fully modelled area is shown in Traffic counts within the same broad area of influence have been used for the purposes of calibration and validation.

3.3.8 Figure 1.1. Traffic counts within the same broad area of influence have been used for the purposes of calibration and validation.

3.3.9 The mobile phone data processing methodology is highly complex and is described in detail in the Harlow Transport Model LMVR – Chapter 7.

3.3.10 Analysis of the mobile phone data that demonstrates its suitability for use in building the Harlow Transport Model is referenced in Chapter 4.

3.4 Automatic Traffic Counts (ATC)

Data Collection

3.4.1 Additional temporary ATC sites were required in a number of locations within the model area to complete the dataset required for the Harlow Transport Model. These were commissioned by Essex County Council's Highway Team and are shown in Figure 2.1 above.

3.4.2 Where possible, ATC surveys were carried out over two continuous weeks, including weekends, 24 hours a day, at the specified locations. Where not possible to collect data over two continuous weeks, a minimum of one week's worth of data was collected, as set out in the Appraisal Specification Report[1], agreed with HE. The surveys were undertaken during July, mainly between 8th July and 21st July 2014 (wave 1), with some additional further counts (wave 2) carried out in October 2014, mainly between 7th October and 13th October 2014, and in February 2015.

3.4.3 Table 3.4 shows newly commissioned ATC survey locations carried out in July 2014, with their specific dates of collection also detailed.

Table 3.4 : Newly Commissioned Automatic Traffic Count Survey Sites for the Harlow Transport Model

Count ID	Site Location	Survey Dates
B6 / D3	Harlow Common, Harlow	08/07/14-21/07/14
E1	A414 Edinburgh Way, Harlow	08/07/14-14/07/14
E2	First Ave Mandela Ave, Harlow	08/07/14-14/07/14
E4	A1169 Southern Way, Harlow	08/07/14-16/07/14
H1	A120 Braintree	15/07/14-21/07/14
J1	Round Coppice Road, Birchanger	08/07/14-21/07/14
J2	Church Road, Stansted	08/07/14-21/07/14
J3	Hall Road, Elsenham	08/07/14-21/07/14
J4	Molehill Green Rd, Dunmow	08/07/14-21/07/14
J5	Bamber's Green, Takeley	08/07/14-14/07/14
J6	Parsonage Road, Takeley	15/07/14-21/07/14
J7	Stansted Services, Takeley	08/07/14-21/07/14
J8	Thremhall Avenue, Stansted Airport	08/07/14-21/07/14
K1	A120 Birchanger	08/07/14-21/07/14
K2	A1060 Hallingbury Road, Bishop's Stortford	08/07/14-21/07/14
K3	A1184 Cambridge Rd, Spellbrook	08/07/14-18/07/14
K6	Hazelend Road, Bishops Stortford	22/07/14-29/07/14
L6	North Hall Road, Quendon	08/07/14-21/07/14
N2	Fanhams Hall Road, Ware	08/07/14-14/07/14
N4	Hollycross Road, Stanstead Abbotts	08/07/14-21/07/14
N5	A1170 London Road, Ware	08/07/14-21/07/14
N6	Hoe Lane, Ware	08/07/14-21/07/14
N8	B1001 Westmill Road, Ware	08/07/14-21/07/14
Z2	Eastwick Rd, Harlow	08/07/14-14/07/14
Z22	B180 Hunsdon Road, Stanstead Abbotts	08/07/14-21/07/14

3.4.4 Table 3.5 details count sites commissioned in October 2014 to provide additional data following the commencement of the model build process. There is also one count, Z10, which was surveyed in February 2015.

Table 3.5 : Additional newly Commissioned Automatic Traffic Count Survey Sites for the Harlow Transport Model

Count ID	Site Location	Survey Dates
A6	Bower Hill, Epping	27/10/14-31/10/14
B1	Stortford Road, Hatfield Heath	16/10/14-22/10/14
B2	Sawbridgeworth Road, Hatfield Heath	16/10/14-22/10/14
E3	A1025 Second Avenue, Harlow	13/10/14-17/10/14
K8	Birchanger Lane, Birchanger	13/10/14-17/10/14
Z6	B1368 Station Road, Braughing	13/10/14-22/10/14
Z10	B184 The Street, High Roding	03/02/15-09/02/15
Z13	B183 Feathers Hill, Hatfield Broad Oak	19/09/14-25/09/14
Z24	B181 High St, Roydon	13/10/14-17/10/14
Z26	B194 Crooked Mile, Waltham Abbey	16/10/14-22/10/14

3.4.5 It should be noted that the Bower Hill (A6) traffic count was collected during a school half term week. As a result of local difficulties with vandalism of the collection equipment, this was the only continuous period available for use. This site is a low flow residential link and therefore it was decided that the data collected was suitable for inclusion in the model building process.

3.4.6 A full list of all count locations used in the model calibration/validation process can be found in **Error! Reference source not found.**.

4. Mobile Phone Data Analysis

4.1 Data Processing

4.1.1 The Harlow Transport Model LMVR, October 2015 (B3553F05/REP/29), Section 7, provides some detail on the mobile phone data processing methodology followed. However, as outlined above, the data extracted for this project was derived from the database owned by INRIX, and used their procedures (covered by their intellectual property rights) to process certain aspects. The database was not available to us for further work.

4.1.2 A series of checks were carried out on the mobile phone data and final trip matrices used to ensure that the data was robust and compared well to other recognised independent sources of trip information.

4.2 Data Validation

4.2.1 A technical note was produced in February 2016 that addressed questions from Highways England (HE) regarding the model and contents of the LMVR. A main focus of this note was to provide evidence of the suitability of mobile phone data and demonstrate validity of the data. The note is entitled Supplementary Information on the Harlow Transport Model (B3553F05/TN/012).

4.2.2 This document provides detailed analysis of the following aspects of the mobile phone data:

- Comparison of mobile phone data against neutral month flows from traffic counts (Section 2.2 – pages 3 & 4);
- Verification of mobile phone matrices against independent sources, including travel patterns in the 2011 census (Section 2.2 – pages 7-9); and
- Verification of purpose splits against those from the National Trip End Model (NTEM) (Section 2.2 – pages 11-13).

5. Automatic Traffic Counts (ATC) and Manual Classified Counts (MCC) Analysis

5.1 Count Data Cordons and Screenlines

5.1.1 The ATC data was organised into cordons and screenlines for the purposes of calibration and validation of the highway model. There are also some counts that will be used as miscellaneous calibration counts. Figure 5.1 shows the location of calibration counts, cordons and screenlines, whilst Figure 5.2 shows the location of validation counts, cordons and screenlines.

Figure 5.1 : Cordons, Screenlines and Miscellaneous Counts for Calibration

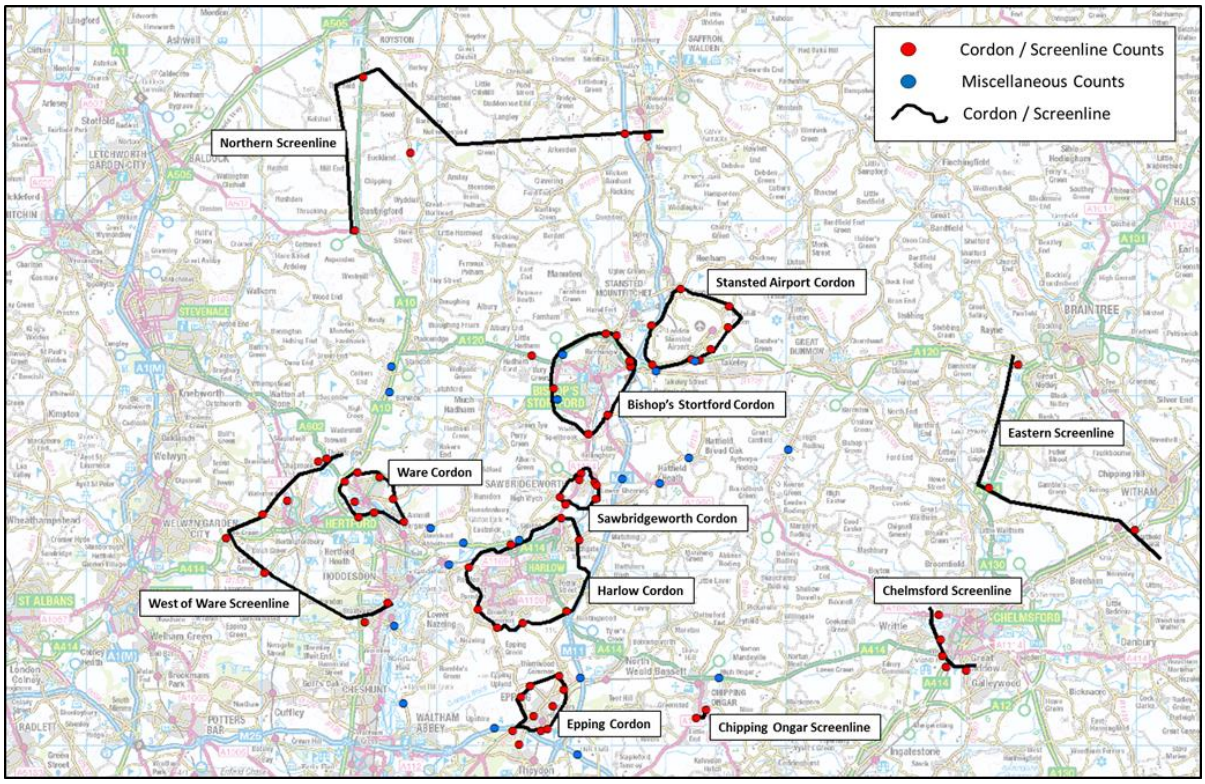

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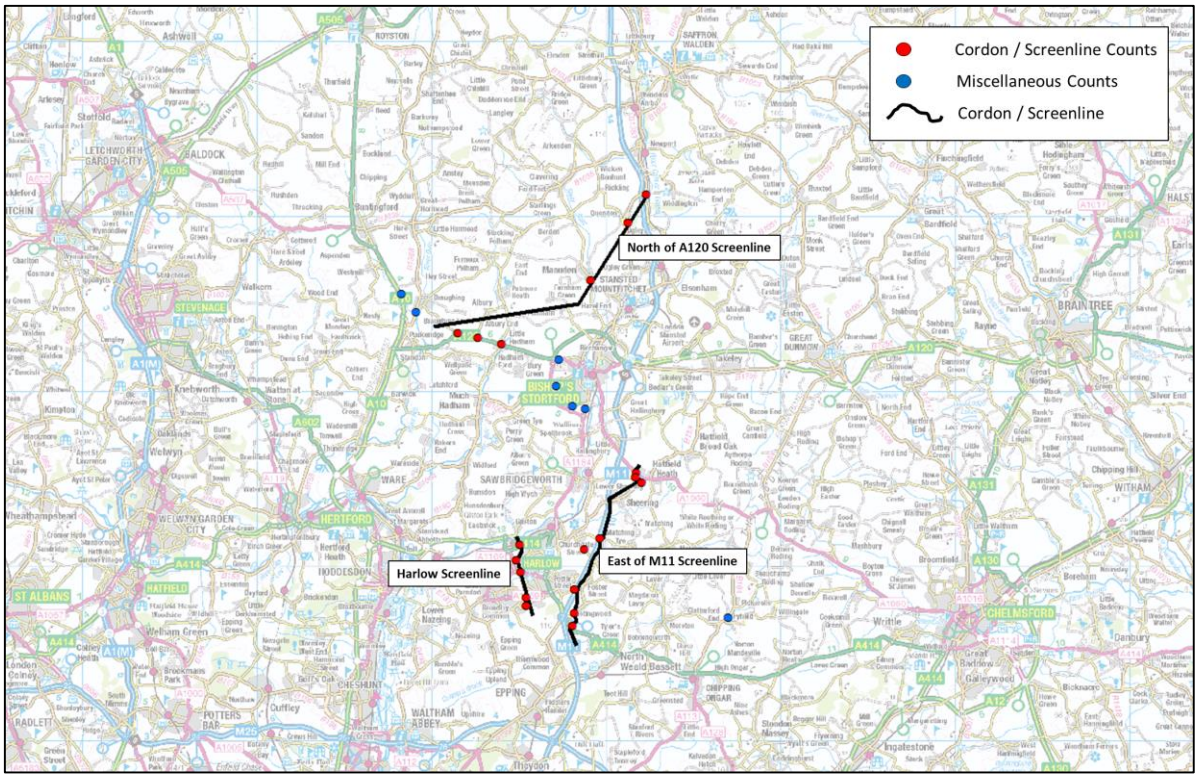
Figure 5.2 : Screenlines and Miscellaneous Counts for Validation



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5.2 ATC Average Weekday Profile

5.2.1 The ATC data for the 'Harlow Cordon' and 'Bishop's Stortford Cordon' sites has been analysed to identify the weekday AM and PM peak periods. The daily traffic flow variation is displayed in Figure 5.3 and Figure 5.4 below.

Figure 5.3: Daily traffic flow variation at Harlow Count Sites

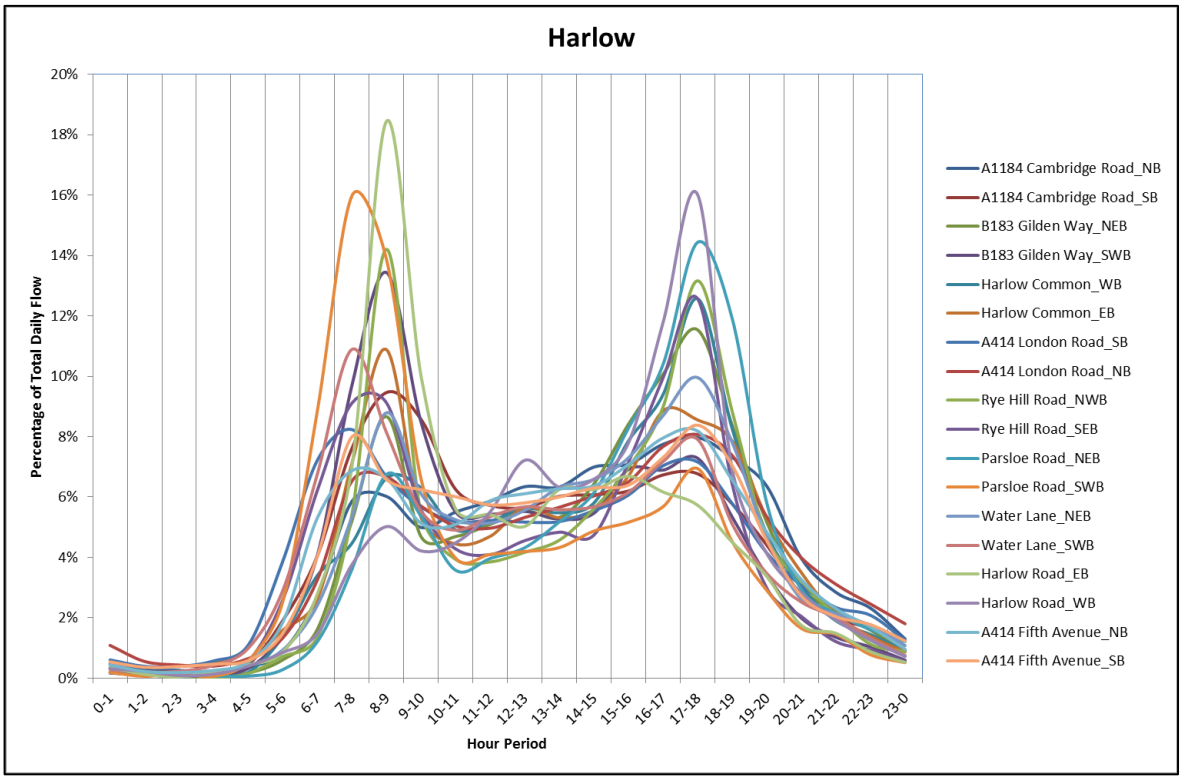
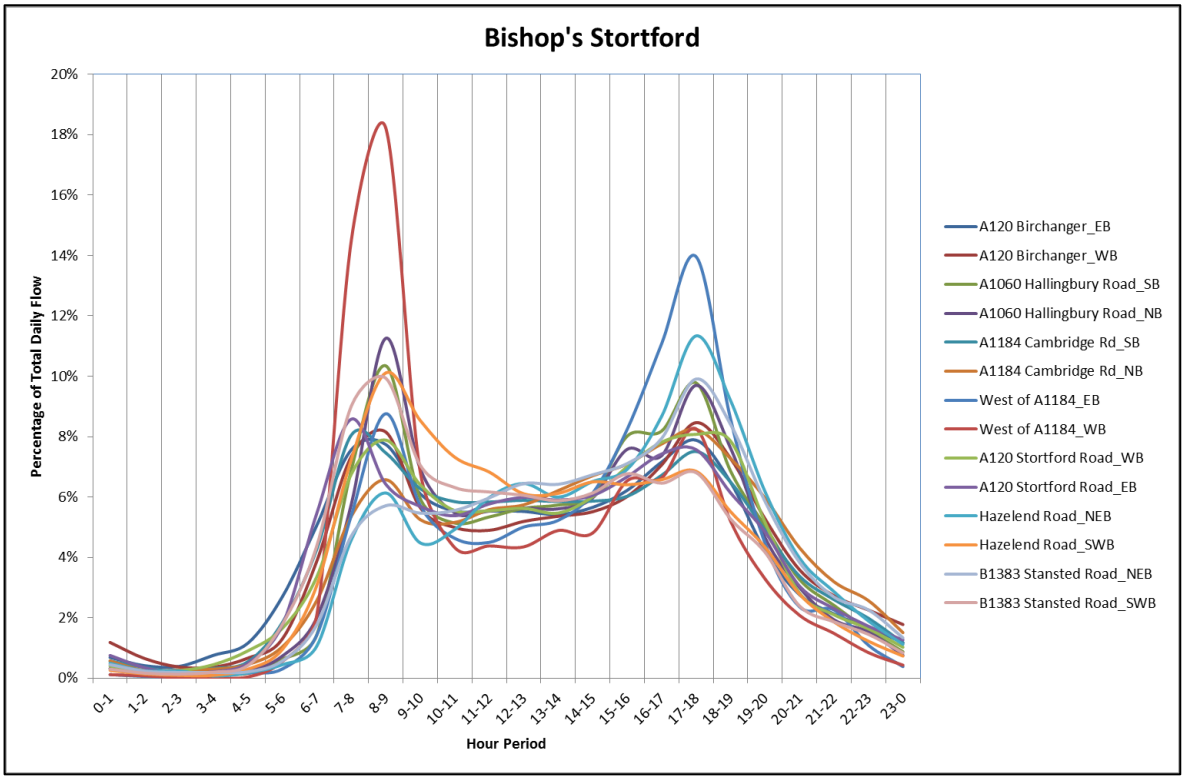


Figure 5.4: Daily traffic flow variation at Bishop's Stortford Count Sites



5.2.2 The graphs show that the AM peak hour is from 08:00 to 09:00, with the PM peak hour from 17:00 to 18:00. Consequently, for modelling purpose and the building of trip matrices the AM and PM peak periods are defined as above.

5.2.3 An inter-peak hour of 11:00 to 12:00 has been chosen to represent the inter-peak period. This was chosen, to maximise the efficiency of the mobile phone data processing.

5.3 ATC and MCC Traffic Flow Summary

5.3.1 All count data (both from existing sources and new surveys) was processed to produce an average weekday flow for each time period.

5.3.2 A road type was also assigned to each count site, this could be either: Motorway, A Road, B Road or Other. Other represents any road, with either a classification below B Road, or any unclassified roads.

5.3.3 In order to keep traffic flow data consistent across all counts seasonal adjustment factors were calculated. These allow for any counts not collected in July 2014 to be adjusted, so that all counts represent traffic conditions for this month.

5.3.4 The factors were calculated by using samples of permanent ATCs and TRADS sites for each of the road types specified above. This produced a list of factors for each road type that would adjust counts to July 2014 levels.

5.3.5 The sites used and seasonality adjustment factors calculated are detailed in Section 5.4.

5.3.6 In addition to the process of seasonally adjusting counts it was also necessary to produce factors to derive the levels of flow by vehicle type. Flows processed from the traffic count data were for all vehicles, and not disaggregated into vehicle types (car, LGV and HGV).

5.3.7 Selected MCC count sites were used to derive vehicle class splits by road type, which would then be applied to each site in the traffic count database.

5.3.8 The MCC sites used and factors produced are detailed in Section 5.5.

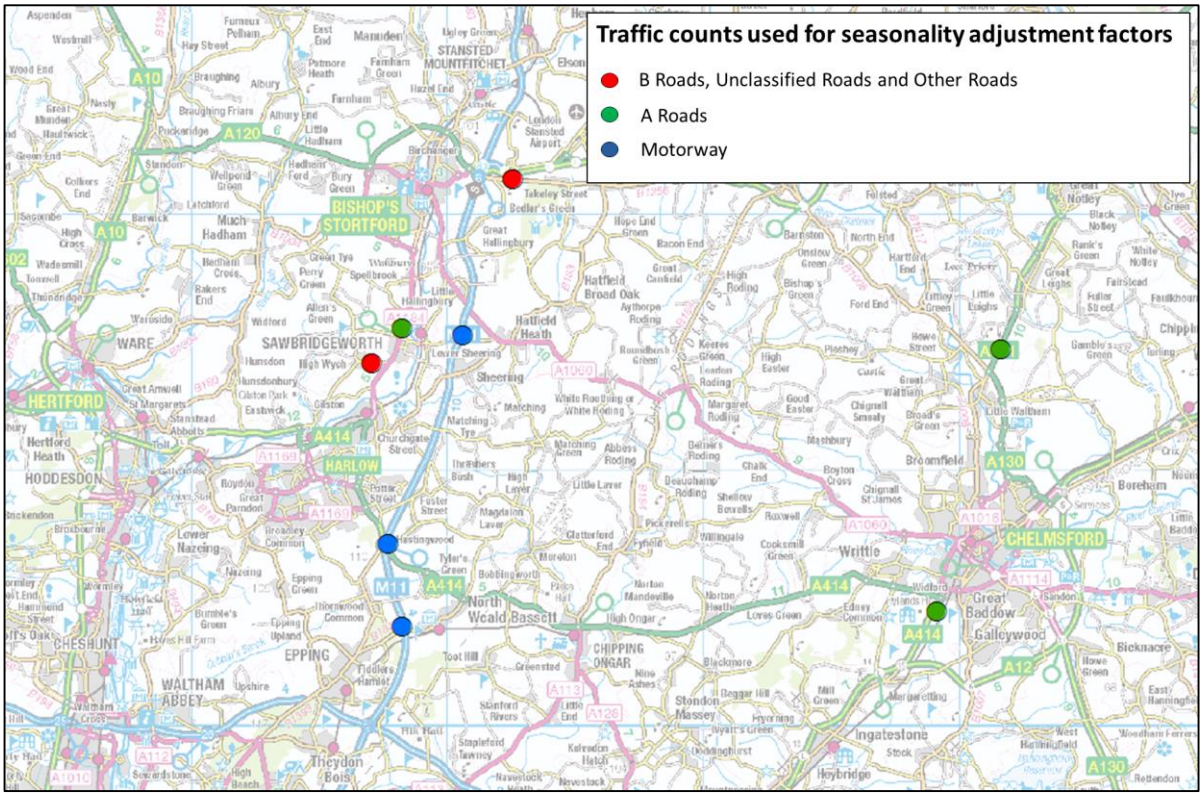
5.3.9 Appendix C shows AM, IP and PM flows for all vehicles after the all of the above processes had been carried out.

5.4 Seasonality Adjustment Factors

5.4.1 The map below in Figure 5.5 displays the samples of traffic counts used in order to produce factors to adjust all counts to July 2014 levels. There are three samples of counts for calculating factors for alternative road types as shown below:

- Motorways;
- A Roads; and
- B Roads, Unclassified Roads and Other Roads.

Figure 5.5: Location of traffic counts used to derive seasonality adjustment factors



5.4.2 All weekdays for each count site were assessed when producing the seasonality adjustment factors, and all 24 hours of data was used for each site. Table 5.1 includes a description of the location of each traffic count as well as the dates of collection.

Table 5.1 : Dates of collection for count sites used in seasonality adjustment factors

Count Location	Road Type	Data Collection Information	
		Start Date	End Date
M11 J6-J7*	Motorway	01/01/2011	31/07/2014
M11 Through J7	Motorway	01/01/2011	30/09/2014
M11 J7-J8	Motorway	01/01/2011	30/09/2014
A1184 Cambridge Road, Sawbridgeworth	A Road	01/01/2011	20/06/2014
A131 Little Leighs, near Chelmsford	A Road	03/01/2011	22/07/2014
A414 Three Mile Hill, Chelmsford	A Road	03/01/2011	23/07/2014
B1256 Tile Kiln Green, Takeley	B, Unclassified or Other Road	03/01/2011	23/07/2014
High Wych Road, High Wych	B, Unclassified or Other Road	20/01/2011	20/06/2014

*Data missing for period between 1st January 2014 and 31st May 2014

5.4.3 A full list of adjustment factors by each month and year can be found in Appendix D.

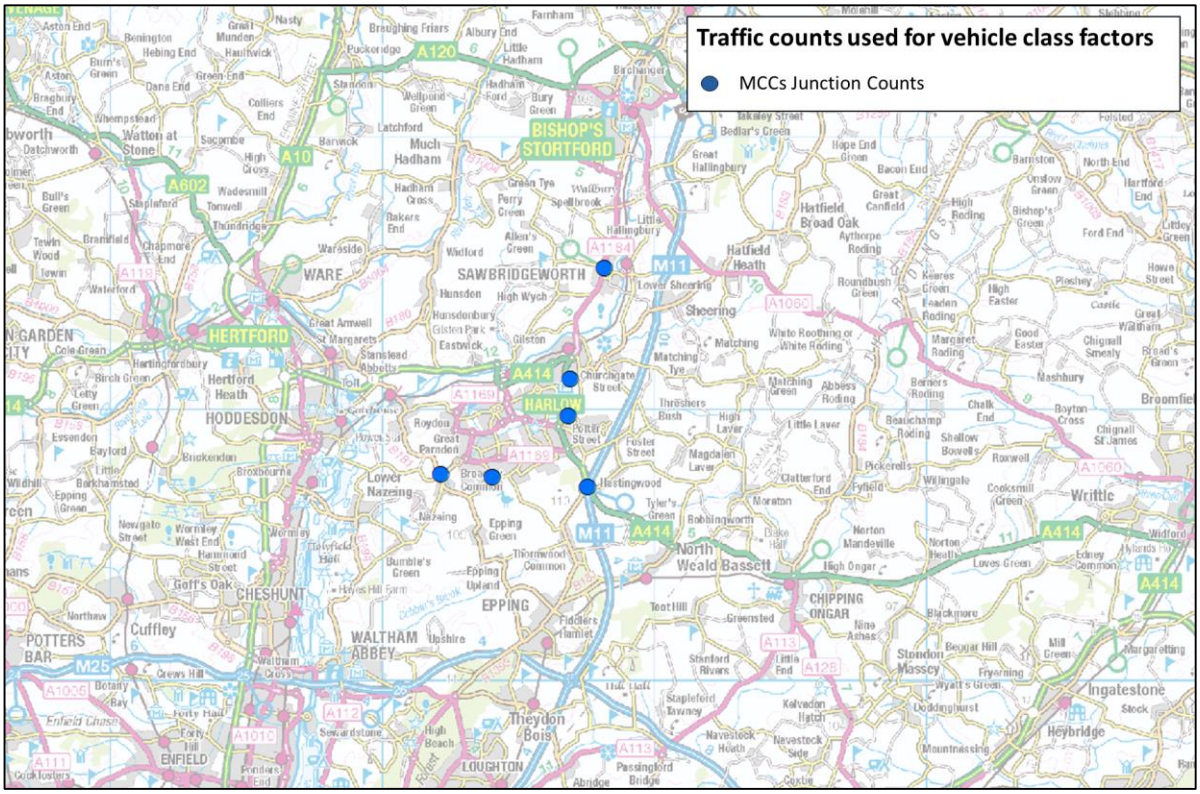
5.5 Vehicle Type Factors

5.5.1 **Error! Reference source not found.** shows the MCCs that were used to calculate factors for splitting vehicle flows from traffic counts into the three vehicle types: Car, LGV and HGV. There are four different samples for producing factors for alternative road types as shown below:

- Motorways;

- A Roads;
- B Roads; and
- Unclassified Roads and Other Roads.

Figure 5.6: Location of MCCs used to derive vehicle type splits for traffic counts



5.5.2 For all of the MCC sites shown above data collection was carried out on 1st April 2014, which was a Tuesday.

5.5.3 Each MCC used has multiple arms; the arm totals for each vehicle class were used to derive splitting factors. Table 5.2 displays the number of arms associated with each road type sample by MCC count site.

Table 5.2 : Junction Arms used in samples for determining Vehicle Type Splitting Factors

Count ID	Location	Number of arms used in sample			
		Motorway	A Road	B Road	Unclassified and Other
MCC1	A414 / Church Lane / Unnamed Road	-	2	-	2
MCC2	B181 Epping Road / Water Lane / Tylers Road	-	-	2	2
MCC3	Paringdon Road / Parsloe Road	-	-	-	3
MCC4	M11 Junction 7	2	2	1	
MCC5	A414 / Church Langley Way	-	2	-	1
MCC6	A414 / B183 First Avenue / First Avenue	-	2	1	1
TOTAL SAMPLE SIZES		**2**	**8**	**4**	**9**

5.5.4 Factors for vehicle types were derived by road class (as above) and time period. The final factors used for splitting traffic counts can be found below in Table 5.3.

Table 5.3 : Final Vehicle Class Factors

Road Class	Time Period	Vehicle Class			
		Car	LGV	HGV	Total
Motorway	AM	78.61%	15.14%	5.04%	98.78%
	IP	79.18%	16.53%	3.14%	98.85%
	PM	83.48%	13.35%	1.77%	98.60%
A Roads	AM	82.71%	13.06%	2.35%	98.13%
	IP	80.03%	16.40%	1.79%	98.21%
	PM	83.30%	13.44%	1.01%	97.75%
B Roads	AM	74.71%	17.58%	6.79%	99.08%
	IP	67.84%	24.74%	6.19%	98.76%
	PM	79.12%	16.96%	2.84%	98.92%
Unclassified and Other Roads	AM	86.91%	10.48%	1.11%	98.50%
	IP	84.39%	12.84%	0.77%	97.99%
	PM	86.16%	11.63%	0.35%	98.14%

5.5.5 For each road class and time period, the sum of the percentage car, LGV and HGV is not 100%. This is because there are a small amount of vehicles that are excluded from the total flows counted at each site in the model. These are non-motorised modes and motorised bicycles.

5.6 Speed Pivoting

5.6.1 The latest guidance for traffic, air quality and noise assessment of links is provided in Interim Advice Note (IAN) 185/15. This document specifies that to increase the accuracy of noise and air quality assessment for highway schemes a process of speed pivoting should be carried out.

5.6.2 This involves understanding how modelled speeds from the base model align with observed data that is available. For the Harlow Transport Model TrafficMaster speed data was available for all links included in the Journey Time Routes displayed and described in Section 2.4.

5.6.3 For the links where observed data was available, speed pivot factors were calculated based upon the difference between the modelled speed and observed speed.

5.6.4 These links were used as a sample in order to produce factors for adjusting the rest of the modelled network. The links were split in to seven road types as follows:

- Motorway
- Urban A Road
- Rural A Road
- Urban B Road
- Rural B Road
- Urban Other
- Rural Other

5.6.5 Factors to adjust speeds, which were weighted by link flows, were produced and are provided in Table 5.4 below.

Table 5.4 : Speed Pivot Factors by Road Type

Road Type	Speed Pivot Factor		
	AM	IP	PM
Motorway	1.02	0.97	0.93
Urban A Road	0.81	0.83	0.76
Rural A Road	0.89	0.94	0.92
Urban B Road	0.90	0.89	0.92
Rural B Road	0.98	0.98	0.99
Urban Other	1.15	1.23	1.08
Rural Other	1.03	0.97	1.00

5.6.6 Once the above speed pivoting factor had been applied checks were completed following the guidance in IAN 185/15.

5.6.7 The number and percentage of links where the modelled speed is within 15% of the observed speed was recorded, and can be seen in Table 5.5.

Table 5.5 : Number of modelled links that are representative of observed data

Road Type	Number of links	Number of passes (modelled links within 15% of observed speeds)			Percentage of passes		
		AM	IP	PM	AM	IP	PM
Motorway	17	17	17	15	100%	100%	88%
Urban A Road	227	79	80	73	35%	35%	32%
Rural A Road	128	54	51	55	42%	40%	43%
Urban B Road	67	34	33	26	51%	49%	39%
Rural B Road	62	25	29	21	40%	47%	34%
Urban Other	46	15	13	13	33%	28%	28%
Rural Other	23	10	13	9	43%	57%	39%
TOTAL	**570**	**234**	**236**	**212**	**41%**	**41%**	**37%**

5.6.8 When producing link speed outputs in the model forecasting process speed banding was also applied to the forecast models using the same factors as explained previously.

5.6.9 For the purposes of noise and air quality modelling links were classified into speed bands as defined in IAN 185/15. To check whether the appropriate speed band had been allocated, a check was performed after forecast models were produced.

5.6.10 This check investigated each link that changed speed band between the base and any forecast model. If the link fell within +/- 16kph of the boundary of speed bands then it was assessed as to whether the change of speed bands was justified and realistic. Professional judgement was used in this analysis and the process rigorously checked by transport, noise and air quality modellers.

5.7 Annualisation and Period Factors

5.7.1 A sample of count data was used to produce period factors for converting traffic flows, speeds and HGV percentages to alternative time periods from those explicitly modelled.

5.7.2 Factors were calculated for four different road types (Motorway, A Road, B Road and Unclassified / Other Roads); a total factor across all road types was also produced. The full tables of factors are displayed in Appendix E.

5.7.3 Table 5.6 shows the traffic counts used for deriving the period factors and highlights the specific information that was available for each count site.

Table 5.6 : Count site samples for producing time period factors

Count Site	5-day Flows	7-day Flows	5-day Speeds	7-day Speeds	5-day HGV Flows	7-day HGV Flows
A1	✓	✓	✓	✓	✓	✓
A2	✓	✓	✓	✓	✓	✓
A3	✓	✓	✓	✓	✓	✓
A4	✓	✓	✓	✓	✓	✓
A5	✓	✓	✓	✓	✓	✓
A6	✓	✓	×	×	✓	✓
A7	✓	✓	✓	✓	✓	✓
A8	✓	✓	✓	✓	✓	✓
A9	✓	✓	×	×	✓	✓
D1	✓	✓	×	×	×	×
D2	✓	✓	×	×	×	×
D3	✓	✓	×	×	✓	✓
D4	✓	✓	✓	✓	✓	✓
D5	✓	✓	×	×	×	×
D6	✓	✓	×	×	×	×
D7	✓	✓	×	×	×	×
D8	✓	✓	×	×	×	×
D9	✓	✓	×	×	×	×
E1	×	×	✓	✓	×	×
E2	×	×	✓	✓	×	×
E4	×	×	✓	✓	×	×
F2	×	×	✓	✓	×	×
J1	×	×	✓	✓	×	×
J2	×	×	✓	✓	×	×
J3	×	×	✓	✓	×	×
J4	×	×	✓	✓	×	×
J5	×	×	✓	✓	×	×
K1	✓	✓	✓	✓	✓	✓
K2	✓	✓	✓	✓	✓	✓
K3	✓	✓	×	×	✓	✓
K4	✓	✓	×	×	×	×
K5	✓	✓	×	×	×	×
K6	✓	✓	×	×	✓	✓
K7	✓	✓	×	×	×	×
K8	✓	✓	×	×	✓	✓
L6	×	×	✓	✓	×	×
N4	×	×	✓	✓	×	×
N5	×	×	✓	✓	×	×
N6	×	×	✓	✓	×	×
N8	×	×	✓	✓	×	×
Z1	✓	×	×	×	×	×
Z2	✓	×	×	×	×	×
Z3	✓	✓	×	×	×	×

Count Site	5-day Flows	7-day Flows	5-day Speeds	7-day Speeds	5-day HGV Flows	7-day HGV Flows
Z4	✓	✓	×	×	✓	✓
Z5	✓	✓	×	×	✓	✓
Z6	✓	×	×	×	×	×
Z7	✓	✓	✓	✓	✓	✓
Z8	✓	✓	×	×	✓	✓
Z9	✓	×	×	×	×	×
Z10	✓	×	×	×	×	×
Z11	✓	×	×	×	×	×
Z12	✓	×	×	×	×	×
Z13	✓	×	×	×	×	×
Z14	✓	×	×	×	×	×
Z15	✓	×	×	×	×	×
Z16	✓	×	×	×	×	×
Z17	✓	×	×	×	×	×
Z18	✓	×	×	×	×	×
Z19	✓	×	×	×	×	×
Z20	✓	×	×	×	×	×
Z21	✓	×	×	×	×	×
Z22	✓	×	×	×	×	×
Z23	✓	×	×	×	×	×
Z24	✓	×	×	×	×	×
Z25	✓	×	×	×	×	×
Z26	✓	×	×	×	×	×
Z27	✓	×	×	×	×	×
TOTAL SAMPLE	**53**	**31**	**25**	**25**	**20**	**20**

6. Journey Time Data Analysis

6.1 Data processing

6.1.1 An average time for each section of the route by direction on a weekday was calculated for each time period. The summation of each section then provided the total observed route time.

6.2 Data summary

The following table shows the resulting total average journey time by direction for each route.

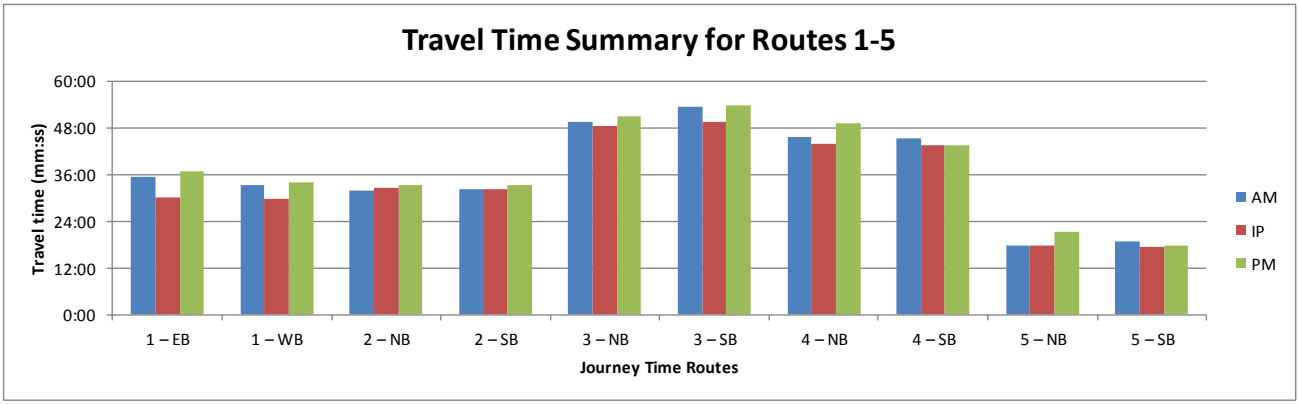
Table 6.1 : Journey Routes - Travel Time Summary

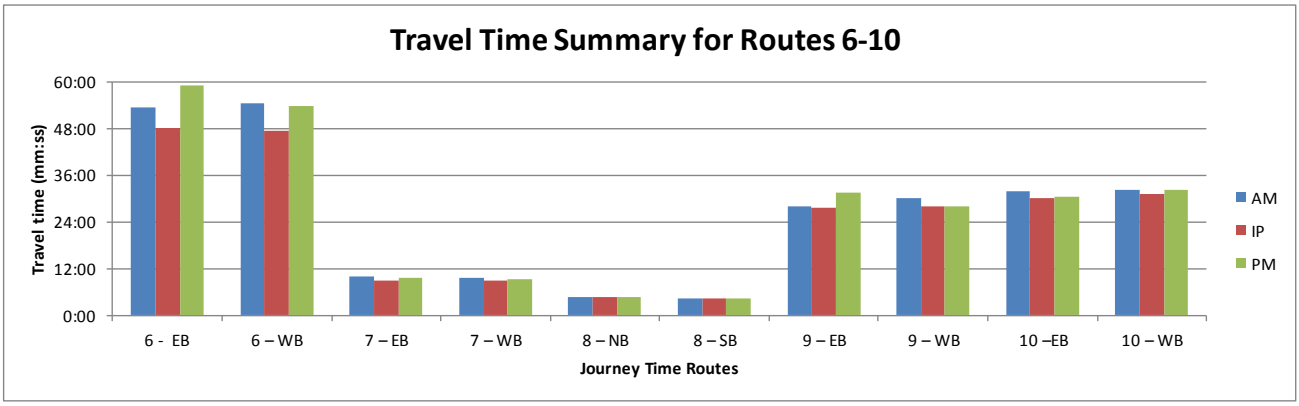
No & Direction	Route Description	Approximate Route Length (km)	Average Journey Times (mm:ss)		
			AM	IP	PM
1 – EB	A120 Puckeridge to A131	41.2	35:32	29:59	36:39
1 – WB	A120 Puckeridge to A131	41.2	33:10	29:42	33:49
2 – NB	M11 J6 to J11	58.2	31:55	32:29	33:16
2 – SB	M11 J6 to J11	58.2	32:12	32:12	33:07
3 – NB	A10 from M25 J25 to M11 J11	60.0	49:18	48:33	50:46
3 – SB	A10 from M25 J25 to M11 J11	60.0	53:16	49:32	53:44
4 – NB	A414 to A11 / M11 J9a via B1383 and A1184 Bishop's Stortford (old A11 north)	11.8	45:30	43:51	48:56
4 – SB	A414 to A11 / M11 J9a via B1383 and A1184 Bishop's Stortford (old A11 north)	11.8	45:15	43:27	43:37
5 – NB	Harlow to Waltham Abbey via Crooked Mile Route	14.8	17:43	17:37	21:18
5 – SB	Harlow to Waltham Abbey via Crooked Mile Route	14.8	18:52	17:18	17:48
6 - EB	A414 from west of Hertford to A12 at Chelmsford	48.4	53:17	47:59	59:04
6 – WB	A414 from west of Hertford to A12 at Chelmsford	48.4	54:15	47:20	53:46
7 – EB	A1250 through Bishop's Stortford (A120 to A1184)	4.9	10:06	09:06	09:42
7 – WB	A1250 through Bishop's Stortford (A120 to A1184)	4.9	09:33	09:03	09:12
8 – NB	A1184 Bishop's Stortford south-west By-pass from A120 to B1383	4.5	04:46	04:34	04:34
8 – SB	A1184 Bishop's Stortford south-west By-pass from A120 to B1383	4.5	04:30	04:21	04:29
9 – EB	B1256 from A120 through Takeley then B183 to Harlow via Hatfield Heath and Sheering	24.2	28:00	27:42	31:34
9 – WB	B1256 from A120 through Takeley then B183 to Harlow via Hatfield Heath and Sheering	24.2	30:01	27:51	27:59
10 –EB	A1060 from A1016 Parkway (Chelmsford) to Bishop's Stortford	28.9	31:41	29:57	30:36
10 – WB	A1060 from A1016 Parkway (Chelmsford) to Bishop's Stortford	28.9	32:16	31:02	32:20
11 – NB	Sawbridgeworth Road, Hallingbury Road, Sheering Lower Road	5.6	07:28	07:22	07:20
11 – SB	Sawbridgeworth Road, Hallingbury Road, Sheering Lower Road	5.6	06:59	07:04	07:51
12 – ACW	A1169 Southern Way, Katherine's Way, A1169 Elizabeth Way (A414 to A414)	8.6	12:05	10:59	13:07
12 – CW	A1169 Southern Way, Katherine's Way, A1169 Elizabeth Way (A414 to A414)	8.6	12:16	11:14	15:40
13 – NB	High Wych Road between A1184 and A414	7.0	09:45	08:40	15:27
13 – SB	High Wych Road between A1184 and A414	7.0	09:35	08:44	11:21
14 – ACW	M25 J25-J28	25.3	22:35	15:38	15:08

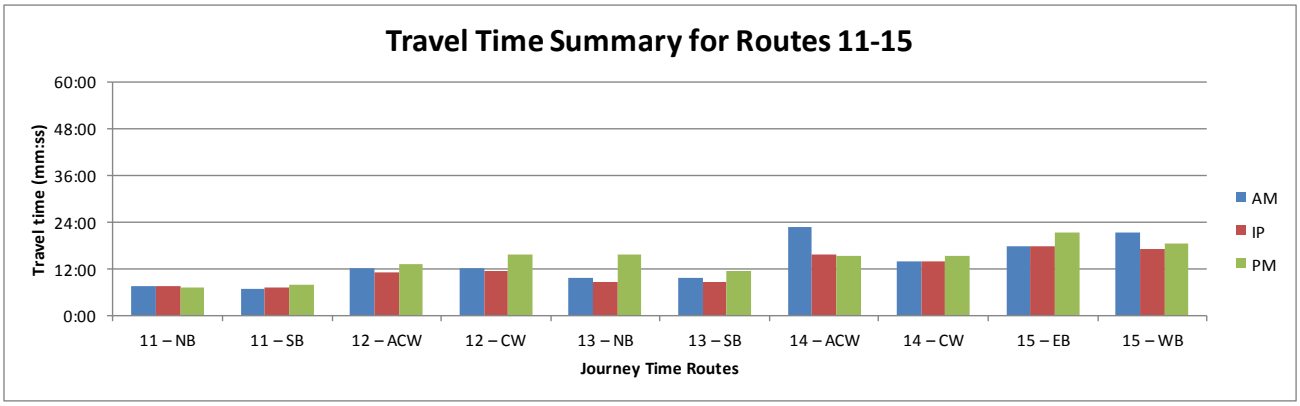
14 – CW	M25 J25-J28	25.3	14:02	13:59	15:14
15 – EB	B1393 / A121 Hastingwood to Waltham Abbey (old A11 south)	13.1	17:46	17:43	21:16
15 – WB	B1393 / A121 Hastingwood to Waltham Abbey (old A11 south)	13.1	21:20	16:59	18:21

The graphs below show the variability in journey times across the routes and time periods.

Figure 6.1 : Route Journey Time Summary by Time Period







More detailed graphs showing how the cumulative journey time varies over distance can be found in Appendix F.

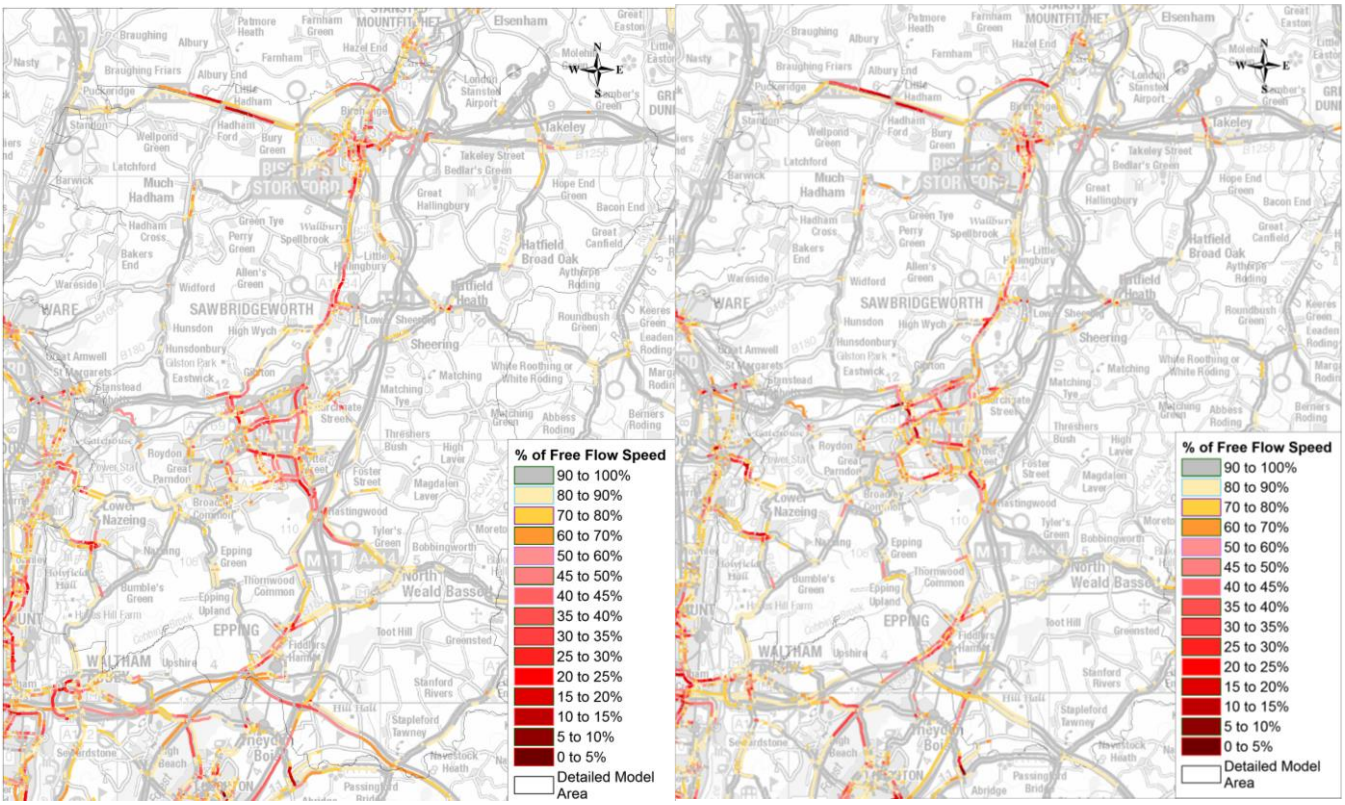
7. Journey Time Delay

Trafficmaster data can be used to derive not just journey times, but also average speed and therefore to analyse congestion.

Congestion is expressed as the percentage of the ‘free-flow’ speed whereby the ‘free-flow’ is measured as a median journey time / speed between 20:00 and 00:00. This is extracted for neutral month averages for Cars and Light Goods Vehicles (up to 3500kg).

The figure below shows congestion in the detailed model area in the AM (0800-0900) and PM (1700-1800), for the period September 2013 - August 2014.

Figure 7.1 : AM and PM peak hour congestion plots



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8. Summary

8.1 Conclusions

8.1.1 This report provides a detailed summary of the existing data used and additional highway surveys undertaken in the Harlow area to support the development of a highway traffic model of the Harlow area to assess a potential new junction on the M11. The surveys provide the necessary information for the model building process such as building trip matrices and for the calibration and validation of the Harlow Transport Model.

8.1.2 The data gathered consists of: Automatic Traffic Counts (ATC), Manual Classified Counts (MCC), journey time data and anonymised mobile phone data.

8.1.3 Each of the surveys undertaken has been described in detail including explaining its purpose, as well as showing the locations and individual survey dates. Analysis has then been carried out for each of the survey types and the results presented under separate chapters.

8.1.4 Analysis of ATC data from the model area shows that the AM peak hour is from 08:00 to 09:00 and the PM peak hour is from 17:00 to 18:00.

Appendix A. Traffic Count Locations and Dates

Full List of Calibration Traffic Count Sites

Count ID	Screenline / Cordon	Location	Count Type	Easting	Northing	Date
A1	Epping	B182 Bury Lane, Epping	ATC	544836	202794	02/07/14-08/07/14
A2	Epping	B181 Lindsey Street, Epping	ATC	545340	203437	02/07/14-08/07/14
A3	Epping	B1393 High Road, Epping	ATC	547025	203967	02/07/14-08/07/14
A4	Epping	B181 Epping Road, Coopersale	ATC	547296	203215	02/07/14-08/07/14
A5	Epping	Stonards Hill, Epping	ATC	546682	202267	02/07/14-08/07/14
A6	Epping	Bower Hill, Epping	ATC	546323	200986	27/10/14-31/10/14
A7	Epping	Bridge Hill / Brook Road, Epping	ATC	546003	200881	02/07/14-08/07/14
A8	Epping	Theydon Road / Piercing Hill, Theydon Bois	ATC	544747	200066	02/07/14-08/07/14
A9	Epping	B1393 High Road, Epping	ATC	544359	200858	02/07/14-08/07/14
C1	Sawbridgeworth	A1184 Cambridge Road, Sawbridgeworth	ATC	548250	215543	05/05/14-16/05/14
C2	Sawbridgeworth	Station Road, Sawbridgeworth	ATC	549058	215060	30/05/14-06/06/14
C3	Sawbridgeworth	Sheering Lower Rd, Sawbridgeworth (north end)	ATC	549140	214911	06/09/14-12/09/13
C4	Sawbridgeworth	Sheering Lower Rd, Sawbridgeworth (south end)	ATC	549123	214116	06/09/14-12/09/13
C5	Sawbridgeworth	A1184 Harlow Road, Sawbridgeworth	ATC	547402	213814	08/07/14-14/07/13
C6	Sawbridgeworth	High Wych Road, High Wych	ATC	547055	214197	05/05/14-16/05/14
C7	Sawbridgeworth	West Road, Sawbridgeworth	MCC	548144	215201	09/07/2013
D1	Harlow	A1184 Cambridge Road, Harlow	ATC	547142	213015	03/03/14-19/03/14
D2	Harlow	B183 Gilden Way, Harlow	ATC	548161	211745	13/03/14-19/03/14
D4	Harlow	A414 London Rd, Harlow	ATC	547454	207671	02/07/13-08/07/13
D5	Harlow	Rye Hill Road, Harlow	ATC	544925	207012	13/03/14-19/03/14
D6	Harlow	Parsloe Road, Harlow	ATC	543483	206776	13/03/14-19/03/14
D7	Harlow	Water Lane, Harlow	ATC	542361	207799	13/03/14-19/03/14
D8	Harlow	Harlow Road, Roydon	ATC	541852	210187	13/03/14-19/03/14
D9	Harlow	A414 Fifth Avenue, Harlow	ATC	544249	211490	13/03/14-19/03/14
F1	Chipping Ongar	A128 Brentwood Road, Marden Ash	ATC	555396	202057	05/05/14-16/05/14
F2	Chipping Ongar	A113 Romford Rd / Stanford Rivers Rd, Marden Ash	ATC	554867	201566	02/07/13-08/07/13
G1	Chelmsford	Roxwell Road, Chelmsford	ATC	568723	207503	19/11/13-25/11/13
G2	Chelmsford	Writtle Road, Chelmsford	ATC	568828	206054	13/05/14-19/05/14
G3	Chelmsford	A414 Writtle Bypass, Chelmsford	ATC	568917	205114	11/06/14-17/06/14
G4	Chelmsford	A414 Three Mile Hill, Chelmsford	ATC	569115	204488	05/05/14-16/05/14
G5	Chelmsford	B1007 Galleywood Road, Chelmsford	ATC	570301	204294	13/05/14-19/05/14
H1	Eastern	A120 Braintree	ATC	573273	221787	15/07/14-21/07/14
H2	Eastern	A131 Little Leighs	ATC	571614	214731	05/05/14-16/05/14
H3	Eastern	A12 Hatfield Peverel	TRADS / PCS	579950	212323	02/06/13-28/06/13
J1	Stansted Airport	Round Coppice Road, Birchanger	ATC	552368	221791	08/07/14-21/07/14
J2	Stansted Airport	Church Road, Stansted	ATC	552271	223999	08/07/14-21/07/14
J3	Stansted Airport	Hall Road, Elsenham	ATC	553946	226128	08/07/14-21/07/14

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Count ID	Screenline / Cordon	Location	Count Type	Easting	Northing	Date
J4	Stansted Airport	School Villas, Molehill Green	ATC	556746	225100	08/07/14-21/07/14
J5	Stansted Airport	Bamber's Green, Takeley	ATC	556659	223899	08/07/14-14/07/14
J6	Stansted Airport	Parsonage Road, Takeley	ATC	555686	222671	15/07/14-21/07/14
J7	Stansted Airport	Stansted Services, Takeley	ATC	555062	222061	08/07/14-21/07/14
J8	Stansted Airport	Thremhall Avenue, Stansted Airport	ATC	554567	222096	08/07/14-21/07/14
K1	Bishop's Stortford	A120 West of M11 J8, Birchanger	ATC	551317	221657	08/07/14-21/07/14
K2	Bishop's Stortford	A1060 Hallingbury Road, Bishop's Stortford	ATC	549763	218893	08/07/14-21/07/14
K3	Bishop's Stortford	A1184 Cambridge Rd, Spellbrook	ATC	548685	217815	08/07/14-18/07/14
K4	Bishop's Stortford	West of A1184 (R'about)	ATC	546686	220396	03/03/14-28/03/14
K5	Bishop's Stortford	A120 Stortford Road, Little Hadham	ATC	545471	222282	14/05/12-21/07/14
K6	Bishop's Stortford	Hazelend Road, Bishops Stortford	ATC	549687	223536	23/07/14-29/07/14
K7	Bishop's Stortford	B1383 Stansted Road, Birchanger	ATC	550300	223433	13/03/12-19/03/12
K8	Bishop's Stortford	Birchanger Lane, Birchanger	ATC	551040	222010	13/10/14-17/10/14
M1	A10 to M11	A507 Baldock Road, Buntingford	ATC	535351	229469	30/05/14-05/06/14
M2	A10 to M11	A10 London Road, Royston	ATC	535797	238214	05/05/14-16/05/14
M3	A10 to M11	B1368 Biggin Hill, Barkway	ATC	538497	233870	30/05/14-05/06/14
M4	A10 to M11	M11 Saffron Walden	TRADS / PCS	550782	234966	15/07/14-21/07/14
M5	A10 to M11	B1383 Cambridge Road, Newport	ATC	552072	234791	21/06/13-27/06/13
N1	Ware	A1170 Wadesmill Road, Ware	ATC	535481	215624	30/05/14-05/06/14
N2	Ware	Fanhams Hall Road, Ware	ATC	536746	215376	08/07/14-14/07/14
N3	Ware	B1004 Widbury Hill, Ware	ATC	537513	214101	31/03/14-06/05/14
N4	Ware	Hollycross Road, Stanstead Abbotts	ATC	538177	212784	08/07/14-21/07/14
N5	Ware	A1170 London Road, Ware	ATC	536421	213350	08/07/14-21/07/14
N6	Ware	Hoe Lane, Ware	ATC	535557	213046	08/07/14-21/07/14
N7	Ware	A119 Hertford Road, Ware	ATC	535335	213933	30/05/14-05/06/14
N8	Ware	B1001 Westmill Road, Ware	ATC	534742	215125	08/07/14-21/07/14
Q1	West of Ware	A10 Wadesmill Bypass	ATC	537336	220233	05/05/14-16/05/14
Q2	West of Ware	Colliers End	ATC	537432	221651	30/05/14-05/06/14
Q3	West of Ware	A602 Westmill Road, Paynes Hall	ATC	533741	216422	14/06/12-20/06/12
Q4	West of Ware	B158 Wadesmill Road, Chapmore End	ATC	533266	216256	14/06/12-20/06/12
Q5	West of Ware	A119 North Road, Hertford	ATC	531482	213997	30/05/14-05/06/14
Q6	West of Ware	B1000 Welwyn Road, Hertford	ATC	530049	213205	05/06/14-11/06/14
Q7	West of Ware	A414 Bypass, Cole Green	ATC	527988	211852	30/05/14-05/06/14
Q8	West of Ware	B158 Lower Hatfield Road, Howe Green	ATC	530190	209867	30/05/12-05/06/12
Q9	West of Ware	A10 Baas Hill, Broxbourne	ATC	535888	207063	02/04/12-06/01/13
Q10	West of Ware	A1170 High Street, Hoddesdon	ATC	537228	208177	26/12/11-02/09/12
Z1	Miscellaneous	B1393 High Road, Epping (north of Lower Bury Lane)	ATC	545568	201711	02/07/13-08/07/13
Z2	Miscellaneous	Eastwick Rd, Harlow	ATC	544734	211774	08/07/14-14/07/14
Z3	Miscellaneous	M25 between J27 and J28	TRADS / PCS	548072	199493	01/01/14-11/04/14
Z4	Miscellaneous	M11 J7-J8	TRADS / PCS	550619	215273	01/06/14-30/06/14
Z5	Miscellaneous	M11 J6-J7	TRADS / PCS	548237	203900	01/06/14-30/06/14

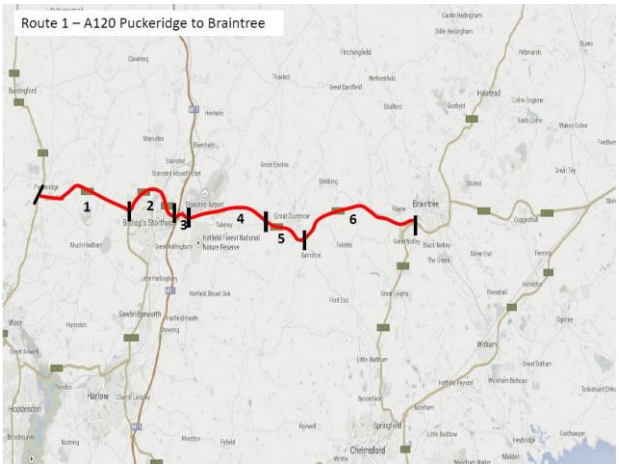
Count ID	Screenline / Cordon	Location	Count Type	Easting	Northing	Date
Z7	Miscellaneous	M11 J5-J6	TRADS / PCS	545578	196969	01/06/14-30/06/14
Z8	Miscellaneous	M25 J26-J27	TRADS / PCS	543302	201003	01/06/13-30/06/14
Z9	Miscellaneous	A1060 Chelmsford Road, Hatfield Heath	ATC	544117	207377	07/05/14-13/05/14
Z10	Miscellaneous	B184 The Street, High Roding	ATC	560114	216938	03/02/15-09/02/15
Z12	Miscellaneous	A414 Chelmsford Road, High Ongar	ATC	556165	203879	02/07/13-08/07/13
Z13	Miscellaneous	B183 Feathers Hill, Hatfield Broad Oak	ATC	554408	216469	19/09/14-25/09/14
Z17	Miscellaneous	A120 north of Hadham Road, Bishops Stortford	ATC	547219	222360	24/03/13-04/04/14
Z19	Miscellaneous	A1184 St James Way, South of Mercers Avenue	ATC	546832	219746	24/03/13-04/04/14
Z20	Miscellaneous	A120 Near Stansted Airport	ATC	554779	221980	15/07/14-21/07/14
Z21	Miscellaneous	B1256 Tile Kiln Green	ATC	552559	221389	05/05/14-16/05/14
Z22	Miscellaneous	B180 Hunsdon Road, Stanstead Abbotts	ATC	539642	212438	08/07/14-21/07/14
Z23	Miscellaneous	A414 E of Roydon	ATC	541571	211588	31/03/13-04/04/13
Z24	Miscellaneous	B181 High St, Roydon	ATC	540714	210337	13/10/14-17/10/14
Z25	Miscellaneous	B194 Nazeing New Road, Broxbourne	ATC	537580	206860	25/04/14-01/05/14
Z26	Miscellaneous	B194 Crooked Mile, Waltham Abbey	ATC	538129	202409	16/10/14-22/10/14

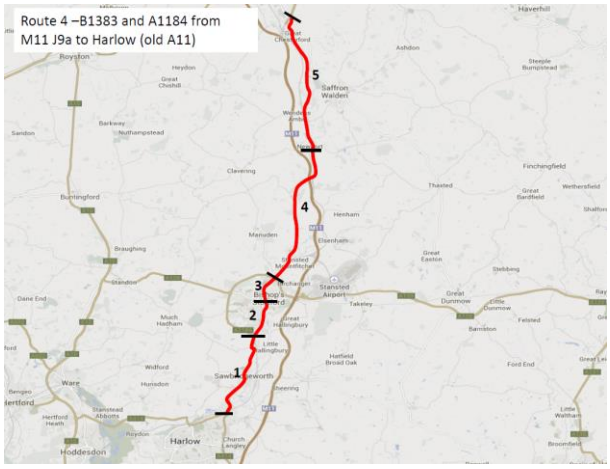
Full List of Validation Traffic Count Sites

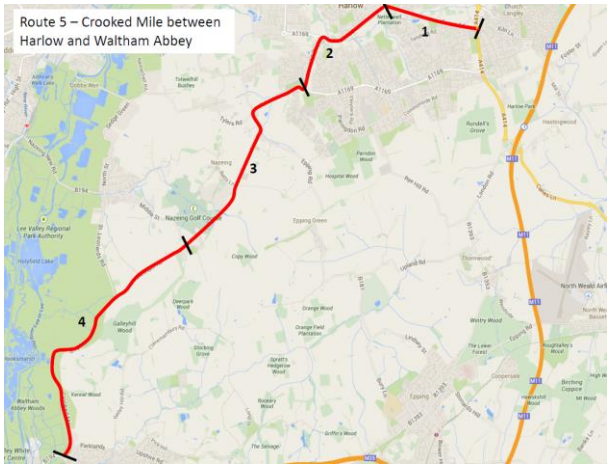
Count ID	Screenline / Cordon	Location	Count Type	Easting	Northing	Date
B1	East of M11	Stortford Road, Hatfield Heath	ATC	551703	215373	16/10/14-22/10/14
B2	East of M11	Sawbridgeworth Road, Hatfield Heath	ATC	551653	215113	16/10/14-22/10/14
B3	East of M11	B183 Sheering Road, Sheering	ATC	552031	214766	01/04/14-04/04/14
B4	East of M11	Matching Road, Churchgate	ATC	549630	211580	27/03/14-07/04/14
B5	East of M11	Hobbs Cross Road, Churchgate	ATC	548758	210960	27/03/14-07/04/14
B6 / D3	East of M11	Harlow Common, Harlow	ATC	548176	208677	08/07/14-21/07/14
B7	East of M11	Hastingwood Road, Hastingwood	ATC	548177	207322	02/07/13-08/07/13
B8	East of M11	A414 Canes Lane, Harlow	ATC	548041	206606	02/07/13-04/07/14
E1	Harlow Screenline	A414 Edinburgh Way, Harlow	ATC	545027	211232	08/07/14-14/07/14
E2	Harlow Screenline	First Ave Mandela Ave, Harlow	ATC	544842	210363	08/07/14-14/07/14
E3	Harlow Screenline	A1025 Second Avenue, Harlow	ATC	545104	209653	13/10/14-17/10/14
E4	Harlow Screenline	A1169 Southern Way, Harlow	ATC	545404	208231	08/07/14-14/08/14
E5	Harlow Screenline	Commonside, Harlow	ATC	545421	207734	13/03/14-19/03/14
L1	North of A120	A120 Standon Road / Horse Cross	MCC	541508	223355	27/03/2014
L2	North of A120	A120/Albury End Road Junction	MCC	542630	223084	03/06/2014
L3	North of A120	A120 / Albury Road	MCC	543985	222713	01/04/2014
L4	North of A120	Carters Hill, Manuden	ATC	549112	226375	29/09/13-04/10/13
L5	North of A120	B1383 Cambridge Road, Quendon	ATC	551262	229642	16/06/14-22/06/14
L6	North of A120	North Hall Road, Quendon	ATC	552291	231277	08/07/14-21/07/14
Z6	Miscellaneous	B1368 Station Road, Braughing	ATC	539091	224566	13/10/14-22/10/14
Z11	Miscellaneous	B184 Ongar Rd, Fyfield	ATC	556983	207054	17/06/13-21/06/13

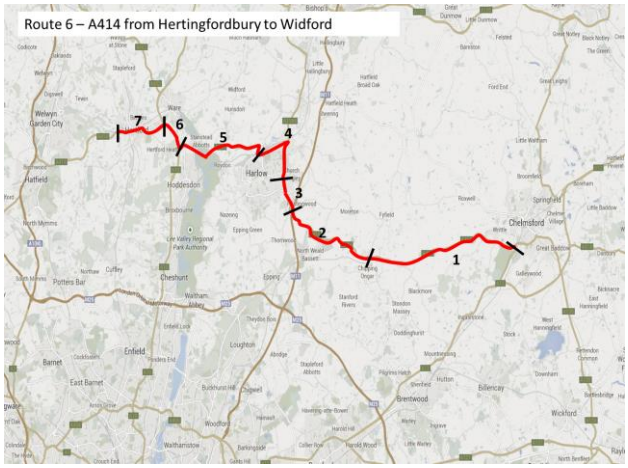
Count ID	Screenline / Cordon	Location	Count Type	Easting	Northing	Date
Z14	Miscellaneous	B1383 Thorley Street, Bishop's Stortford	ATC	548805	218999	08/07/14-17/07/14
Z15	Miscellaneous	Obrey Way, Bishops Stortford	ATC	548086	219145	08/07/14-21/07/14
Z16	Miscellaneous	B1004 east of A1184, Bishops Stortford	ATC	547131	220403	24/03/13-04/04/14
Z18	Miscellaneous	Hadham Road, Bishops Stortford	ATC	547304	221838	24/03/13-04/04/14
Z27	Miscellaneous	A10 Hamels Park, Hay Street	ATC	538282	225605	05/05/14-16/05/14

Appendix B. Journey Time Data – Route Locations and Timing Points









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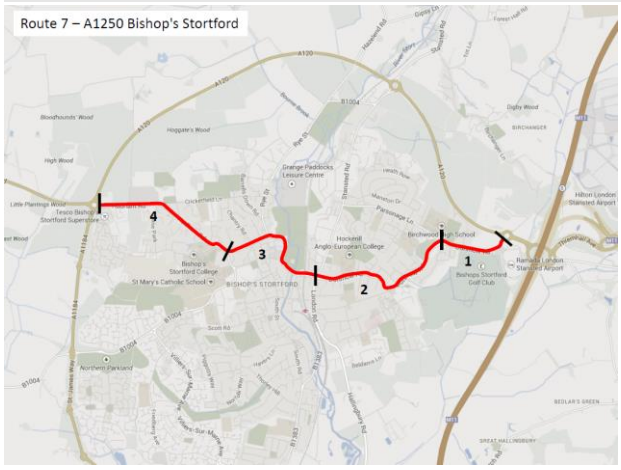
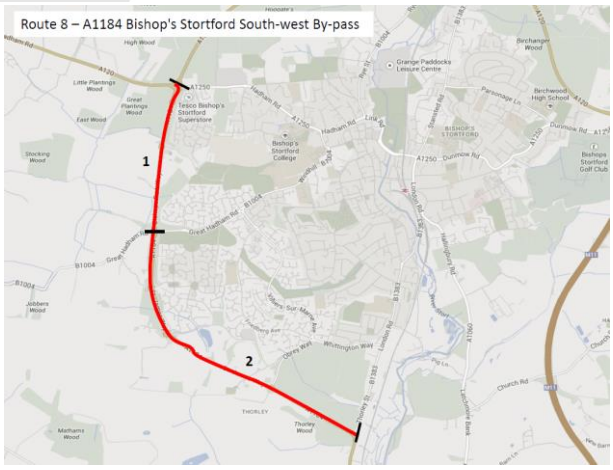
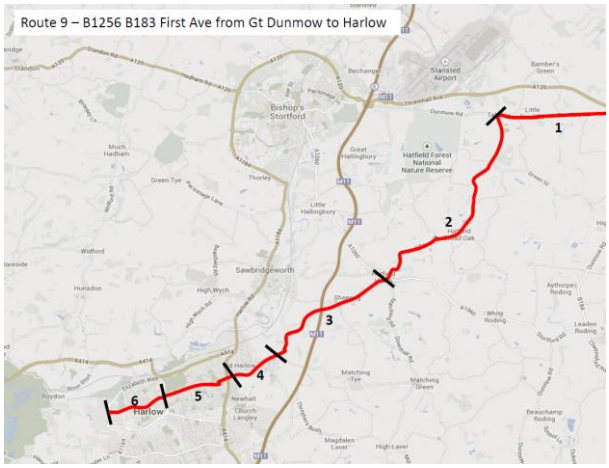
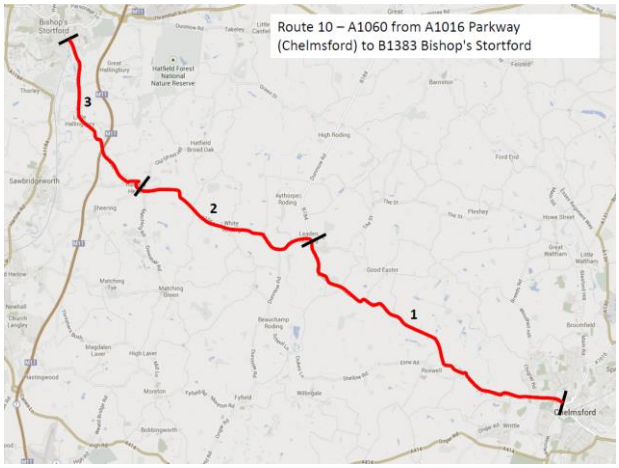
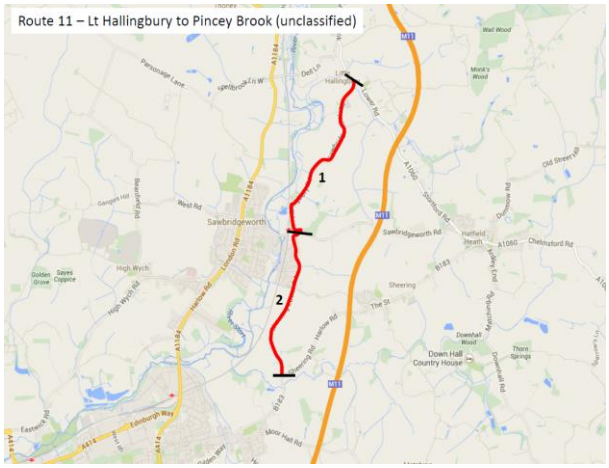
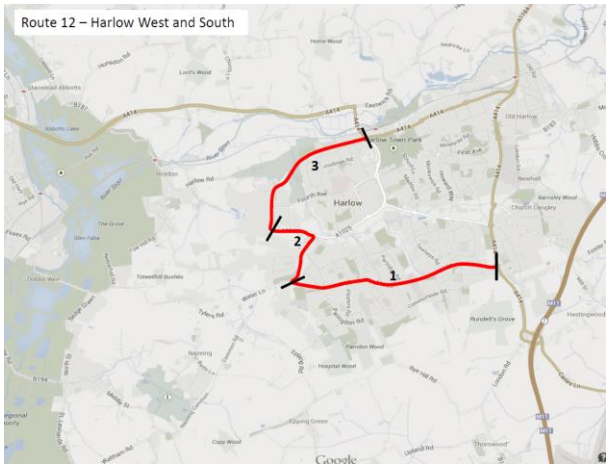

Route 7 – A1250 Bishop's Stortford
1
2
3
4

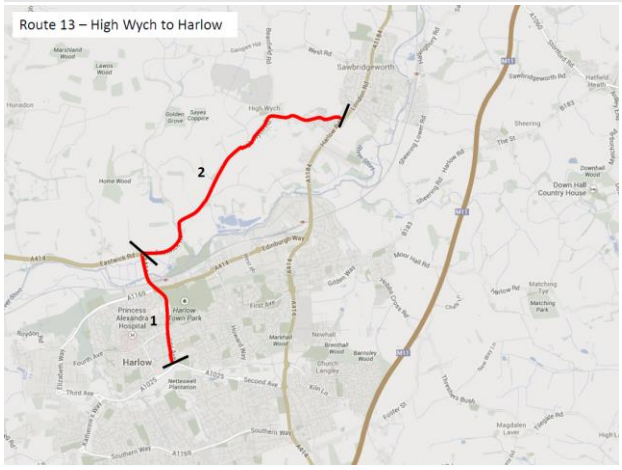

Route 8 – A1184 Bishop's Stortford South-west By-pass
1
2

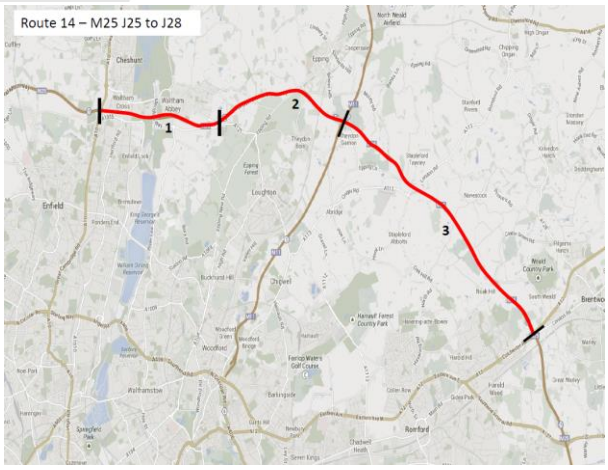

Route 9 – B1256 B183 First Ave from Gt Dunmow to Harlow
1
2
3
4
5
6

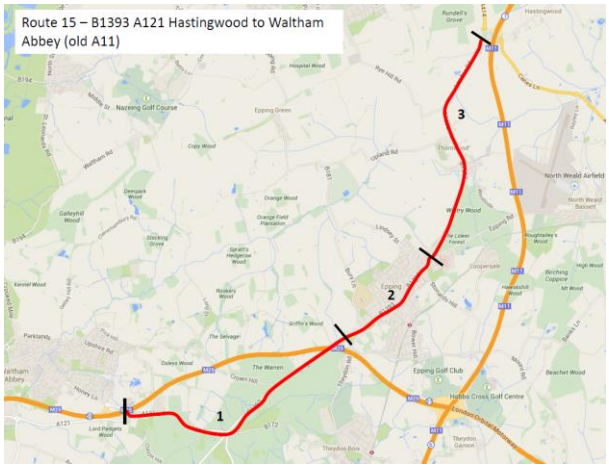

Route 10 – A1060 from A1016 Parkway
(Chelmsford) to B1383 Bishop's Stortford
1
2
3


Route 11 – Lt Hallingbury to Pincey Brook (unclassified)
1
2


Route 12 – Harlow West and South
1
2
3


Route 13 – High Wych to Harlow
1
2
Harlow
Sawbridgeworth
High Wych


Route 14 – M25 J25 to J28
1
2
3
Enfield
Romford


Route 15 – B1393 A121 Hastingwood to Waltham Abbey (old A11)
1
2
3
Waltham Abbey
Epping Golf Club
Hollies Cross Golf Centre

Appendix C. Traffic Count Data

Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
Epping Cordon Inbound	A1_SB	BURY LANE	376	138	278
	A2_EB	LINDSEY STREET	295	93	149
	A3_SB	THORNWOOD ROAD	681	539	616
	A4_SWB	EPPING ROAD	715	366	379
	A5_NWB	STONARDS HILL	139	76	143
	A6_NB	BOWER HILL	127	115	124
	A7_WB	BRIDGE HILL	206	80	101
	A8_NB	THEYDON ROAD	396	249	292
	A9_NEB	EPPING ROAD	789	703	746
	Total		**3724**	**2359**	**2828**
Epping Cordon Outbound	A1_NB	BURY LANE	225	136	299
	A2_WB	LINDSEY STREET	163	88	232
	A3_NB	THORNWOOD ROAD	535	563	984
	A4_NEB	EPPING ROAD	336	336	563
	A5_SEB	STONARDS HILL	105	78	140
	A6_SB	BOWER HILL	95	115	175
	A7_EB	BRIDGE HILL	124	76	153
	A8_SB	THEYDON ROAD	302	228	256
	A9_SWB	EPPING ROAD	963	708	904
	Total		**2848**	**2328**	**3706**
East of M11 Screenline Eastbound	B1_SB	A1060 STORTFORD ROAD	399	171	312
	B2_EB	SAWBRIDGEWORTH ROAD	204	121	240
	B3_EB	THE STREET	345	214	575
	B4_EB	MATCHING ROAD	49	50	65
	B5_EB	HOBBS CROSS ROAD	127	48	65
	B6_EB	HARLOW COMMON	205	89	161
	B7_NEB	HASTINGWOOD ROAD	114	74	171
	B8_SEB	CANES LANE	557	441	805
	Total		**2000**	**1208**	**2394**
East of M11 Screenline Westbound	B1_NB	A1060 STORTFORD ROAD	341	162	340
	B2_WB	SAWBRIDGEWORTH ROAD	257	130	211
	B3_WB	THE STREET	686	258	347
	B4_WB	MATCHING ROAD	66	46	50
	B5_WB	HOBBS CROSS ROAD	113	44	132
	B6_WB	HARLOW COMMON	116	92	221
	B7_SWB	HASTINGWOOD ROAD	176	70	86
	B8_NWB	CANES LANE	756	450	604
	Total		**2511**	**1252**	**1991**

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Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
Sawbridgeworth Cordon Inbound	C1_SB	CAMBRIDGE ROAD	825	682	865
	C2_WB	STATION ROAD	266	174	238
	C3_SB	SHEERING LOWER ROAD	264	75	210
	C4_NB	SHEERING LOWER ROAD	142	55	257
	C5_NB	HARLOW ROAD	572	563	633
	C6_EB	HIGH WYCH ROAD	445	311	555
	C7_EB	WEST ROAD	287	146	251
	Total		**2801**	**2006**	**3009**
Sawbridgeworth Cordon Outbound	C1_NB	CAMBRIDGE ROAD	938	633	905
	C2_EB	STATION ROAD	208	155	250
	C3_NB	SHEERING LOWER ROAD	235	88	240
	C4_SB	SHEERING LOWER ROAD	204	55	103
	C5_SB	HARLOW ROAD	841	630	569
	C6_WB	HIGH WYCH ROAD	652	315	441
	C7_WB	WEST ROAD	144	68	186
	Total		**3222**	**1944**	**2694**
Harlow Cordon Inbound	D1_SB	HARLOW ROAD	983	594	702
	D2_SWB	GILDEN WAY	1117	451	603
	B6_WB	HARLOW COMMON	116	92	221
	D4_NB	LONDON ROAD	1769	1320	2139
	D5_NWB	RYE HILL ROAD	180	48	167
	D6_NEB	PARSLOE ROAD	192	113	410
	D7_NEB	WATER LANE	759	444	857
	D8_EB	HARLOW ROAD	409	120	126
	D9_SB	FIFTH AVENUE ALLENDE AVENUE	848	742	1079
	Total		**6373**	**3924**	**6304**
Harlow Cordon Outbound	D1_NB	HARLOW ROAD	557	543	737
	D2_NEB	GILDEN WAY	719	424	954
	B6_EB	HARLOW COMMON	205	89	161
	D4_SB	LONDON ROAD	1748	1371	1874
	D5_SEB	RYE HILL ROAD	100	44	136
	D6_SWB	PARSLOE ROAD	436	129	218
	D7_SWB	WATER LANE	713	470	691
	D8_WB	HARLOW ROAD	109	119	344
	D9_NB	FIFTH AVENUE ALLENDE AVENUE	915	814	1130
	Total		**5502**	**4003**	**6245**
Harlow Screenline Eastbound	E1_EB	EDINBURGH WAY	650	682	955
	E2_EB	FIRST AVENUE MANDELA AVENUE	682	758	1099
	E3_EB	SECOND AVENUE	697	793	1236
	E4_EB	SOUTHERN WAY	867	726	881

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Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
	E5_NEB	MAUNDS HATCH	242	107	477
	Total		**3138**	**3066**	**4648**
Harlow Screenline Westbound	E1_WB	EDINBURGH WAY	1120	737	913
	E2_WB	FIRST AVENUE MANDELA AVENUE	1100	706	641
	E3_WB	SECOND AVENUE	1007	863	830
	E4_WB	SOUTHERN WAY	1159	695	908
	E5_SWB	MAUNDS HATCH	270	99	188
	Total		**4656**	**3100**	**3480**
Ongar Screenline Northbound	F1_NB	BRENTWOOD ROAD	278	221	384
	F2_NEB	LONDON ROAD	269	240	613
	Total		**547**	**461**	**997**
Ongar Screenline Southbound	F1_SB	BRENTWOOD ROAD	365	222	320
	F2_SWB	LONDON ROAD	593	220	295
	Total		**958**	**442**	**615**
Chelmsford Screenline Eastbound	G1_EB	ROXWELL ROAD	722	430	835
	G2_EB	CHELMSFORD ROAD	527	229	352
	G3_EB	A414 ONGAR ROAD	516	420	686
	G4_NB	THREE MILE HILL	1475	777	1351
	G5_NB	WOOD STREET	712	425	574
	Total		**3952**	**2281**	**3798**
Chelmsford Screenline Westbound	G1_WB	ROXWELL ROAD	804	417	581
	G2_WB	CHELMSFORD ROAD	359	255	414
	G3_WB	A414 ONGAR ROAD	695	404	532
	G4_SB	THREE MILE HILL	1211	810	1361
	G5_SB	WOOD STREET	570	470	827
	Total		**3639**	**2356**	**3715**
Eastern Cordon Eastbound	H1_EB	A120 BRAINTREE	1196	1110	2168
	H2_NEB	A131 LITTLE LEIGHS	846	678	1514
	H3_EB	A12 HATFIELD PEVEREL	3242	2390	4356
	Total		**5284**	**4178**	**8038**
Eastern Cordon Westbound	H1_WB	A120 BRAINTREE	1811	1060	1250
	H2_SWB	A131 LITTLE LEIGHS	1435	697	934
	H3_WB	A12 HATFIELD PEVEREL	4055	2429	3351
	Total		**7301**	**4186**	**5535**
Stanstead Airport Cordon Inbound	J1_NEB	ROUND COPPICE ROAD	485	265	313
	J2_EB	CHURCH ROAD	321	142	242
	J3_SB	HALL ROAD	200	97	133
	J4_SWB	BRICK END	145	60	66
	J5_NWB	BAMBER'S GREEN	49	28	44
	J6_NB	PARSONAGE ROAD	235	151	217

Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
	J7_NWB	STANSTED SERVICES, A120	377	244	250
	J8_NEB	THREMHALL AVENUE	602	737	804
	Total		**2414**	**1724**	**2069**
Stanstead Airport Cordon Outbound	J1_SWB	ROUND COPPICE ROAD	312	196	455
	J2_WB	CHURCH ROAD	265	114	326
	J3_NB	HALL ROAD	134	101	206
	J4_NEB	BRICK END	57	56	146
	J5_SEB	BAMBER'S GREEN	35	24	48
	J6_SB	PARSONAGE ROAD	178	116	222
	J7_SEB	STANSTED SERVICES, A120	170	166	396
	J8_SWB	THREMHALL AVENUE	655	654	933
	Total		**1806**	**1427**	**2732**
Bishop's Stortford Cordon Inbound	K1_WB	A120 BIRCHANGER	1509	908	1564
	K2_NB	HALLINGBURY ROAD	519	256	446
	K3_NB	A1184 SPELLBROOK	640	544	800
	K4_EB	GREAT HADHAM ROAD	212	109	337
	K5_EB	STORTFORD ROAD	572	514	673
	K6_SWB	HAZELEND ROAD	270	181	183
	K7_SWB	STANSTED ROAD	912	567	623
	K8_SB	BIRCHANGER LANE	55	44	68
	Total		**4689**	**3123**	**4694**
Bishop's Stortford Cordon Outbound	K1_EB	A120 BIRCHANGER	1440	1031	1463
	K2_SB	HALLINGBURY ROAD	487	251	459
	K3_SB	A1184 SPELLBROOK	737	576	739
	K4_WB	GREAT HADHAM ROAD	469	113	212
	K5_WB	STORTFORD ROAD	738	519	754
	K6_NEB	HAZELEND ROAD	189	183	348
	K7_NEB	STANSTED ROAD	521	546	901
	K8_NB	BIRCHANGER LANE	119	36	37
	Total		**4700**	**3255**	**4913**
North of A120 Screenline Northbound	L1_NWB	HORSE CROSS	19	22	14
	L2_NB	ALBURY END	24	13	34
	L3_NB	ALBURY ROAD	56	66	78
	L4_NB	THE STREET	134	106	192
	L5_NB	B1383 QUENDON	382	235	457
	L6_NB	NORTH HALL ROAD	75	49	58
	Total		**690**	**491**	**833**
North of A120 Screenline Southbound	L1_SEB	HORSE CROSS	15	26	12
	L2_SB	ALBURY END	36	4	15
	L3_SB	ALBURY ROAD	112	61	61

Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
	L4_SB	THE STREET	198	129	134
	L5_SB	B1383 QUENDON	519	264	395
	L6_SB	NORTH HALL ROAD	48	41	62
	Total		**928**	**525**	**679**
A10 to M11 Screenline Northbound	M1_WB	BALDOCK ROAD	479	234	549
	M2_NB	LONDON ROAD	378	258	487
	M3_NB	LONDON ROAD	88	52	103
	M4_NB	M11 SAFFRON WALDEN	2372	2337	2461
	M5_NB	LONDON ROAD	742	395	566
	Total		**4059**	**3276**	**4166**
A10 to M11 Screenline Southbound	M1_EB	BALDOCK ROAD	548	227	399
	M2_SB	LONDON ROAD	429	225	368
	M3_SB	LONDON ROAD	112	48	96
	M4_SB	M11 SAFFRON WALDEN	2042	1942	2524
	M5_SB	LONDON ROAD	661	390	696
	Total		**3792**	**2832**	**4083**
Ware Cordon Inbound	N1_SB	WADESMILL ROAD	514	223	383
	N2_WB	FANHAMS HALL ROAD	34	18	23
	N3_WB	B1004 WIDBURY HILL	211	66	85
	N4_NWB	HOLLYCROSS ROAD	133	70	168
	N5_NWB	VIADUCT ROAD	581	414	570
	N6_NB	HOE LANE	381	97	152
	N7_EB	WARE ROAD	398	382	570
	N8_SEB	WESTMILL ROAD	831	360	703
	Total		**3083**	**1630**	**2654**
Ware Cordon Outbound	N1_NB	WADESMILL ROAD	406	271	481
	N2_EB	FANHAMS HALL ROAD	38	22	36
	N3_EB	B1004 WIDBURY HILL	83	72	150
	N4_SEB	HOLLYCROSS ROAD	208	106	163
	N5_SEB	VIADUCT ROAD	504	450	606
	N6_SB	HOE LANE	332	123	188
	N7_WB	WARE ROAD	432	318	338
	N8_NWB	WESTMILL ROAD	586	397	786
	Total		**2589**	**1759**	**2748**
West of Ware Screenline Westbound	Q3_NB	WESTMILL ROAD	1209	562	1361
	Q4_NEB	WADESMILL ROAD	402	168	430
	Q5_NB	NORTH ROAD	250	223	537
	Q6_WB	WELWYN ROAD	315	184	518
	Q7_WB	A414 HERTINGFORDBURY	1588	878	1187
	Q8_SWB	LOWER HATFIELD ROAD	445	126	253

Cordon / Screenline	Site ID	Location	Hourly Flows (All Vehicles)		
			AM (8-9)	IP (11-12)	PM (17-18)
	Q9_SB	A10 BROXBOURNE	2381	1562	2288
	Q10_SB	HIGH ROAD	830	699	862
	Total		**7420**	**4402**	**7436**
West of Ware Screenline Eastbound	Q3_SB	WESTMILL ROAD	1365	536	1159
	Q4_SWB	WADESMILL ROAD	538	168	303
	Q5_SB	NORTH ROAD	482	217	206
	Q6_EB	WELWYN ROAD	629	180	288
	Q7_EB	A414 HERTINGFORDBURY	981	750	1395
	Q8_NEB	LOWER HATFIELD ROAD	321	142	534
	Q9_NB	A10 BROXBOURNE	2077	1554	2466
	Q10_NB	HIGH ROAD	954	699	1053

Appendix D. Adjustment Factors for Seasonality

Year	Month	Adjustment Factor		
		Motorway	A Road	B Roads and Other Roads
2011	Jan	1.12	1.11	1.18
2011	Feb	1.05	1.09	1.21
2011	Mar	1.04	1.08	1.42
2011	Apr	1.00	1.14	1.49
2011	May	1.01	1.09	1.17
2011	Jun	0.98	1.07	1.15
2011	Jul	0.93	1.08	1.13
2011	Aug	0.94	1.12	1.14
2011	Sep	0.96	1.07	1.21
2011	Oct	0.97	1.07	1.18
2011	Nov	1.05	1.07	1.07
2011	Dec	1.06	1.19	1.18
2012	Jan	1.14	1.13	1.13
2012	Feb	1.08	1.11	1.11
2012	Mar	1.03	1.07	1.05
2012	Apr	1.01	1.12	1.11
2012	May	1.01	1.08	1.06
2012	Jun	0.97	1.13	1.10
2012	Jul	0.99	1.09	1.08
2012	Aug	0.93	1.13	1.15
2012	Sep	0.98	1.07	1.06
2012	Oct	1.00	1.09	1.08
2012	Nov	1.05	1.07	1.06
2012	Dec	1.11	1.21	1.26
2013	Jan	1.19	1.14	1.13
2013	Feb	1.08	1.10	1.07
2013	Mar	1.06	1.09	1.06
2013	Apr	1.01	1.10	1.07
2013	May	0.98	1.11	1.08
2013	Jun	0.97	1.07	1.03
2013	Jul	0.95	1.08	1.15
2013	Aug	0.94	1.17	1.20
2013	Sep	0.99	1.00	1.09
2013	Oct	0.99	0.98	1.19
2013	Nov	1.08	0.99	1.04
2013	Dec	1.09	1.22	1.30
2014	Jan	1.24	1.09	1.09
2014	Feb	1.14	1.00	1.08
2014	Mar	1.13	0.98	1.03
2014	Apr	1.05	1.07	1.00
2014	May	1.06	1.08	1.05
2014	Jun	0.95	1.04	1.00

Year	Month	Adjustment Factor		
		Motorway	A Road	B Roads and Other Roads
2014	**Jul**	**1.00**	**1.00**	**1.00**
2014	Aug	0.99	1.10	1.11
2014	Sep	1.03	1.01	1.07
2014	Oct	1.05	1.01	1.09

Appendix E. Summary of Time Period Factors

Factors to convert modelled traffic flows

Road Type	AM peak to period	IP peak to period	PM peak to period	12hr AAWT to 24hr AAWT	12hr AAWT to 12hr OP	12hr AAWT to 18hr AAWT	12hr AAWT to 4hr AAWT Evening	12hr AAWT to 8hr AAWT Night	24hr AAWT to 24hr AADT
	0800-0900 to 0700-1000	1100-1200 to 1000-1600	1700-1800 to 1600-1900	0700-1900 to 24hr	0700-1900 to 1900-0700	0700-1900 to 0600-000	0700-1900 to 1900-2300	0700-1900 to 2300-0700	
Motorway	3.05	6.48	2.88	1.40	0.40	1.28	0.17	0.23	0.96
A Road	2.76	6.39	2.72	1.28	0.28	1.22	0.15	0.13	0.94
B Road	2.63	6.42	2.68	1.25	0.25	1.22	0.15	0.10	0.82
Unclassified / Other	2.41	6.58	2.60	1.22	0.22	1.19	0.15	0.07	0.93
TOTAL	**2.82**	**6.45**	**2.77**	**1.33**	**0.33**	**1.25**	**0.16**	**0.17**	**0.93**

Factors to convert modelled traffic speeds

Road Type	AM peak to period	IP peak to period	PM peak to period	12hr AAWT to 24hr AAWT	12hr AAWT to 12hr OP	12hr AAWT to 18hr AAWT	12hr AAWT to 4hr AAWT Evening	12hr AAWT to 8hr AAWT Night	24hr AAWT to 24hr AADT
	0800-0900 to 0700-1000	1100-1200 to 1000-1600	1700-1800 to 1600-1900	0700-1900 to 24hr	0700-1900 to 1900-0700	0700-1900 to 0600-000	0700-1900 to 1900-2300	0700-1900 to 2300-0700	
Motorway	0.97	1.00	1.04	1.01	1.03	1.01	1.07	1.00	1.03
A Road	1.05	1.00	1.03	1.02	1.08	1.01	1.09	1.07	1.01
B Road	1.03	1.01	1.00	1.02	1.07	1.01	1.06	1.09	1.01
Unclassified / Other	1.02	0.97	1.00	1.01	1.07	1.01	1.02	1.17	1.01
TOTAL	**1.03**	**1.00**	**1.03**	**1.03**	**1.10**	**1.02**	**1.09**	**1.12**	**1.02**

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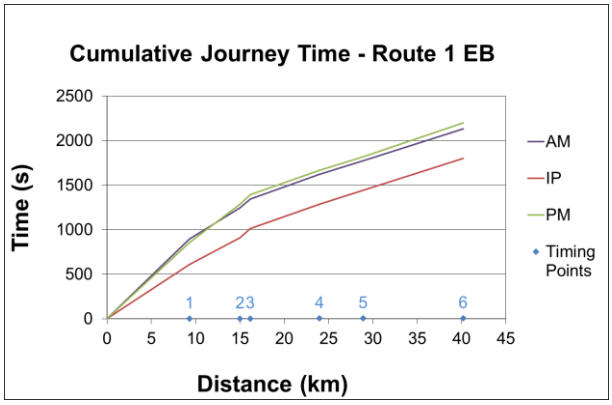
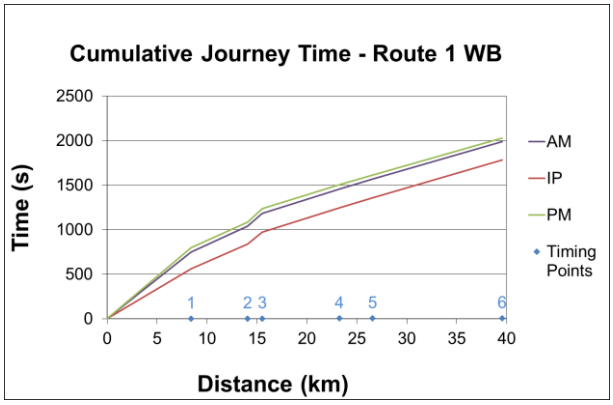
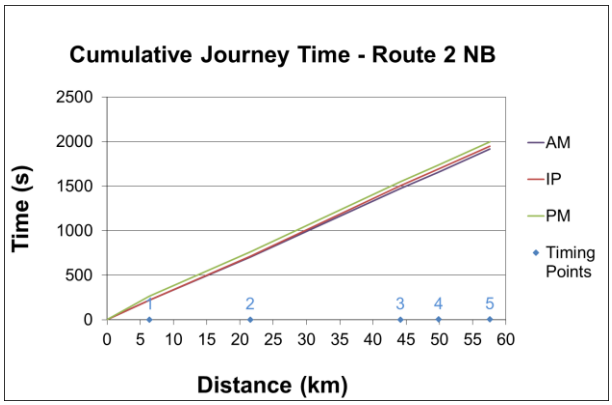
Factors to convert modelled HGV flow percentages

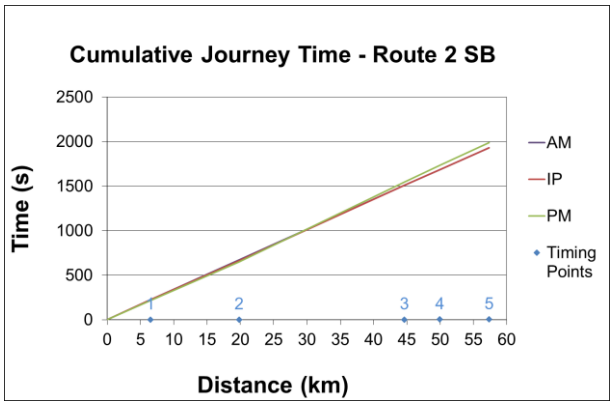
Road Type	AM peak to period	IP peak to period	PM peak to period	12hr AAWT to 24hr AAWT	12hr AAWT to 12hr OP	12hr AAWT to 18hr AAWT	12hr AAWT to 4hr AAWT Evening	12hr AAWT to 8hr AAWT Night	24hr AAWT to 24hr AADT
	0800-0900 to 0700-1000	1100-1200 to 1000-1600	1700-1800 to 1600-1900	0700-1900 to 24hr	0700-1900 to 1900-0700	0700-1900 to 0600-000	0700-1900 to 1900-2300	0700-1900 to 2300-0700	
Motorway	1.04	0.93	1.08	1.11	0.89	1.05	0.89	1.44	0.75
A Road	1.08	0.93	1.01	1.03	0.62	1.01	0.62	1.31	0.90
B Road	0.97	0.98	1.14	1.06	0.73	1.05	0.73	1.50	0.84
Unclassified / Other	1.10	0.95	1.38	1.12	0.50	1.08	0.50	3.60	0.85

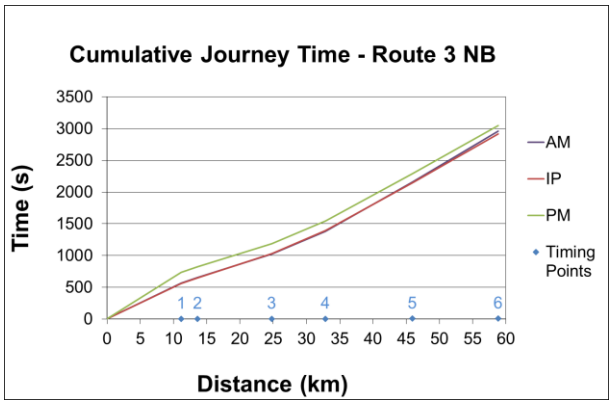
Appendix F. Cumulative Journey Time Graphs

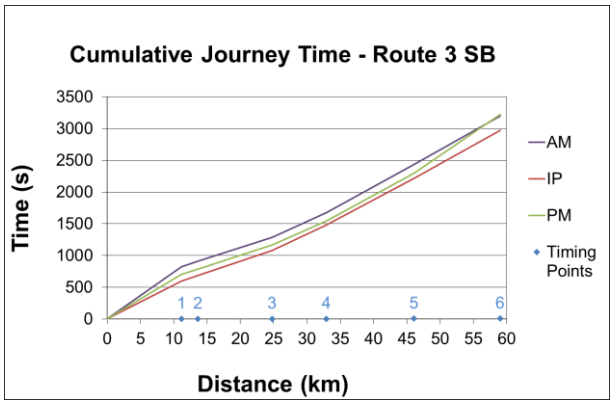


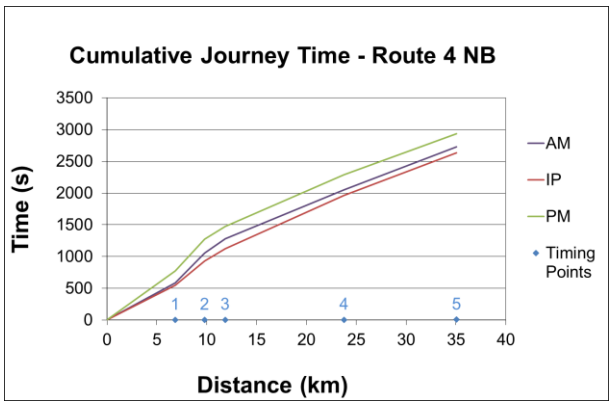


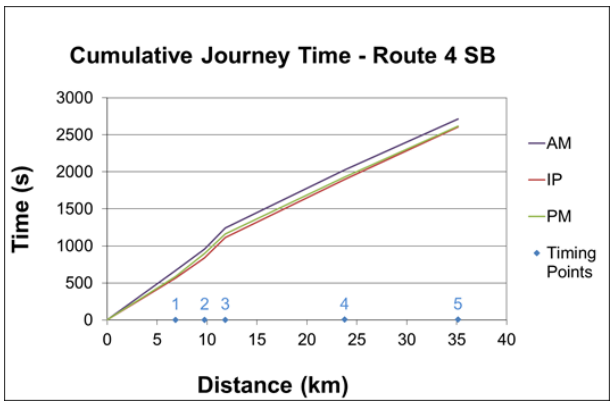


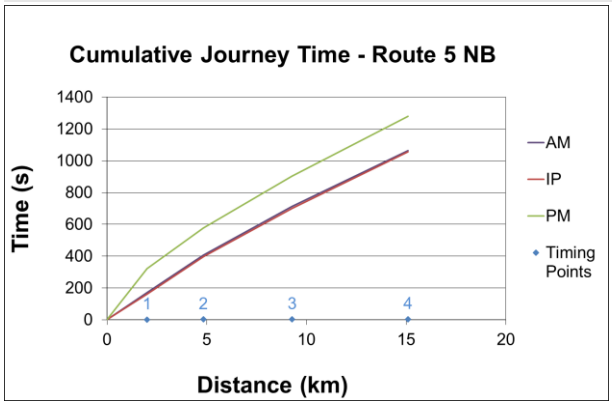


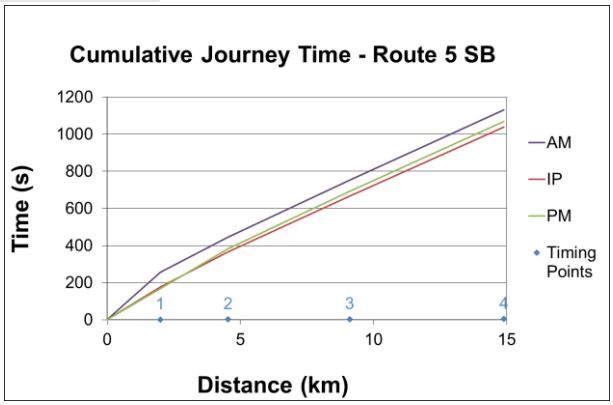


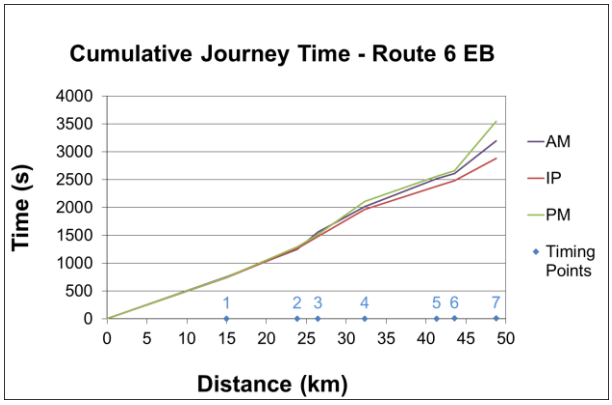


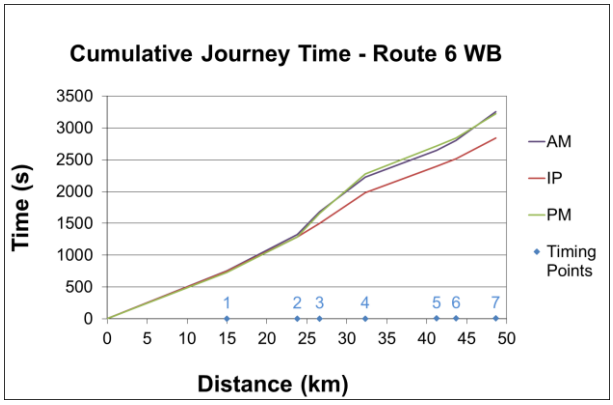


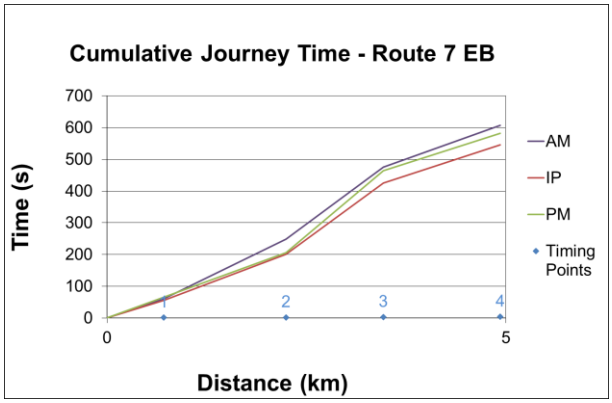


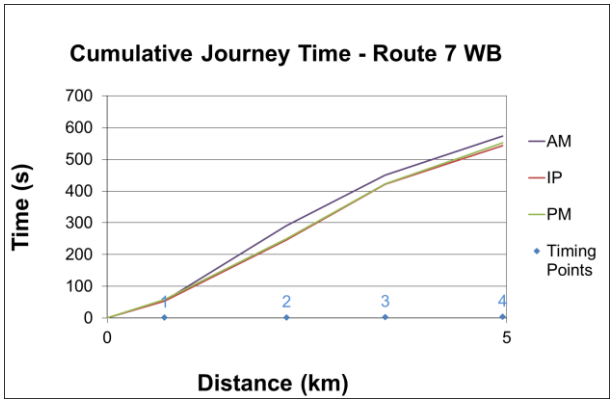

Cumulative Journey Time - Route 5 NB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

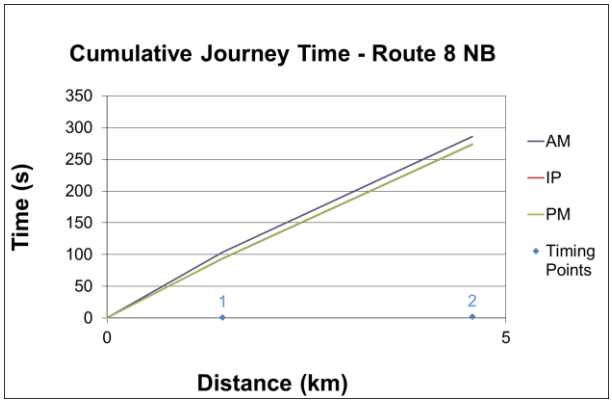

Cumulative Journey Time - Route 5 SB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

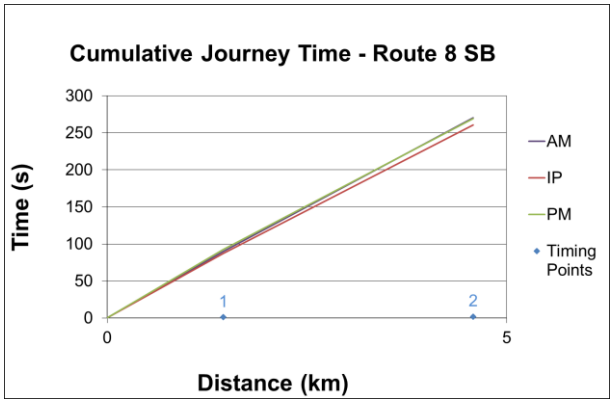

Cumulative Journey Time - Route 6 EB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

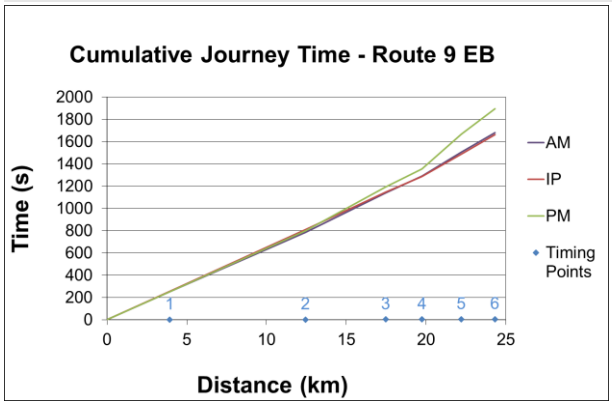

Cumulative Journey Time - Route 6 WB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

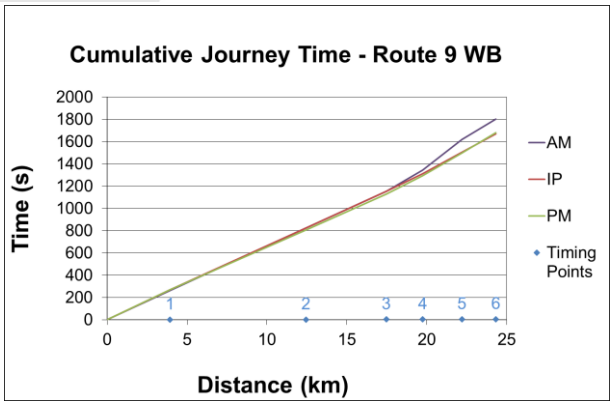

Cumulative Journey Time - Route 7 EB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

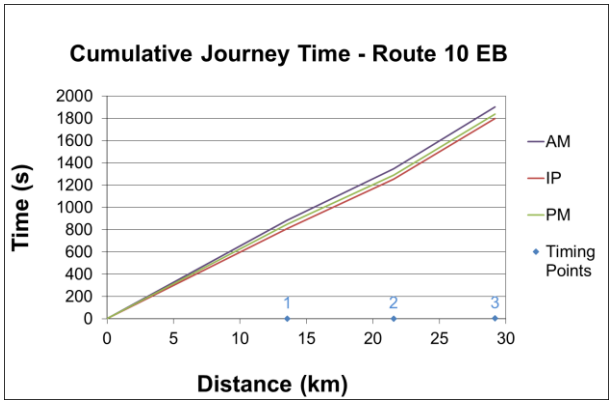

Cumulative Journey Time - Route 7 WB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

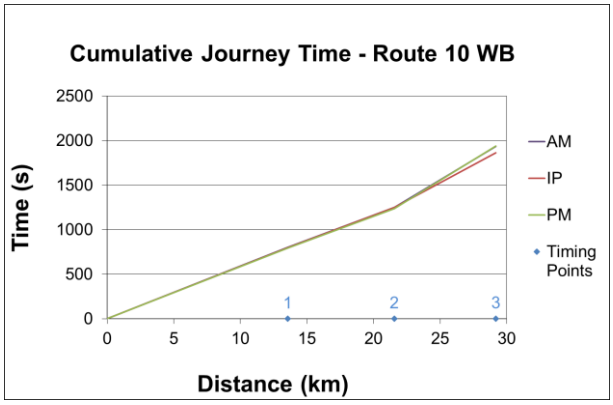

Cumulative Journey Time - Route 8 NB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

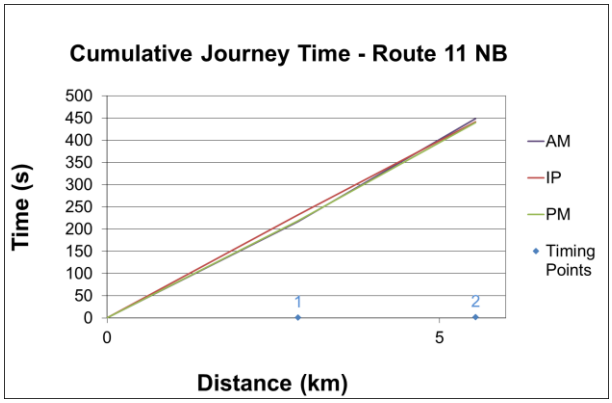

Cumulative Journey Time - Route 8 SB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

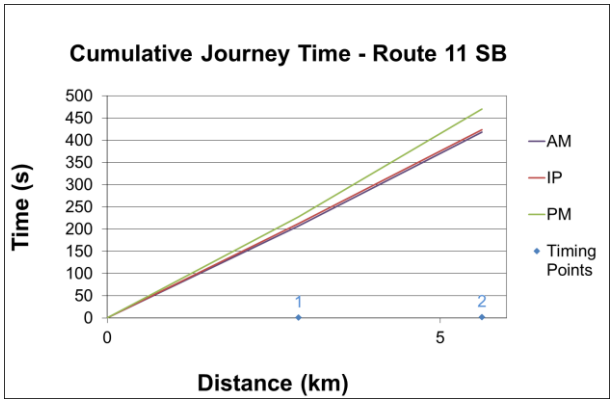

Cumulative Journey Time - Route 9 EB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

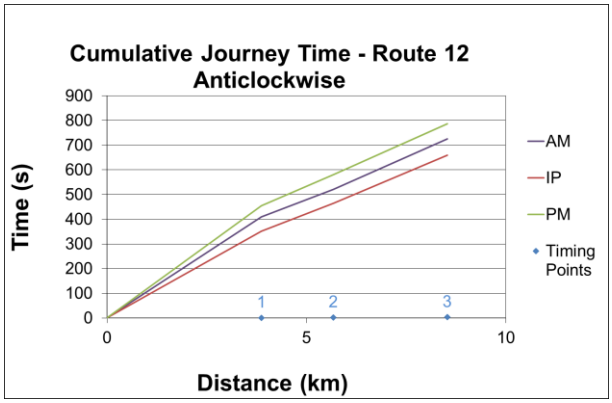

Cumulative Journey Time - Route 9 WB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

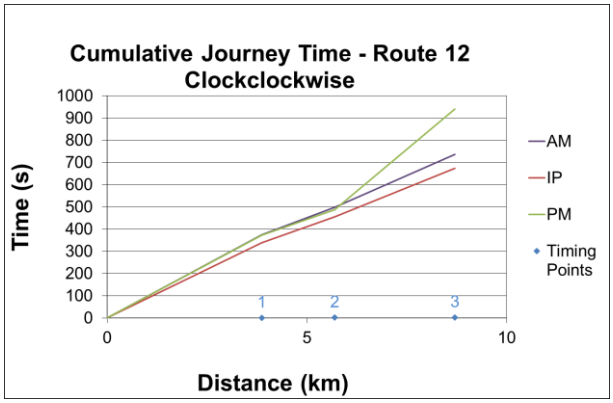

Cumulative Journey Time - Route 10 EB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

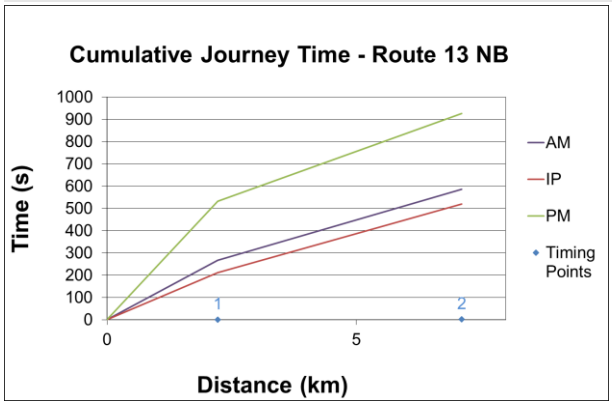

Cumulative Journey Time - Route 10 WB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

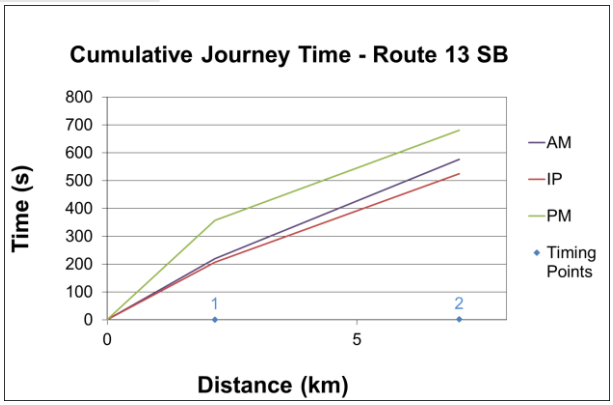

Cumulative Journey Time - Route 11 NB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

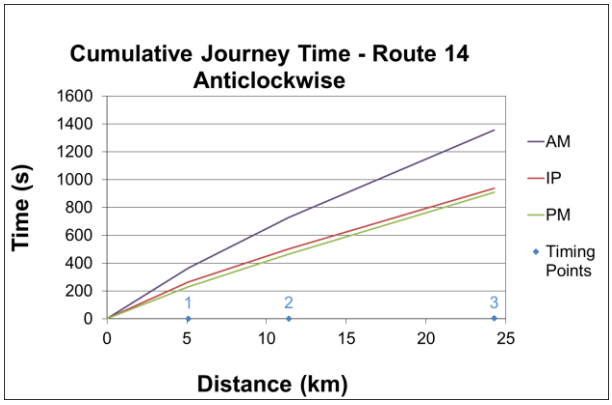

Cumulative Journey Time - Route 11 SB
Time (s)
Distance (km)
AM
IP
PM
Timing Points

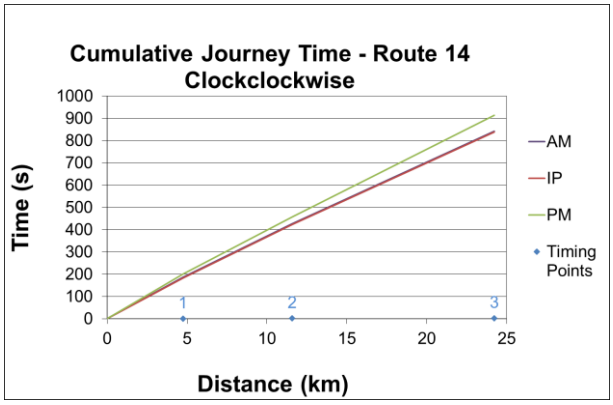

Cumulative Journey Time - Route 12 Anticlockwise
Time (s)
Distance (km)
AM
IP
PM
Timing Points

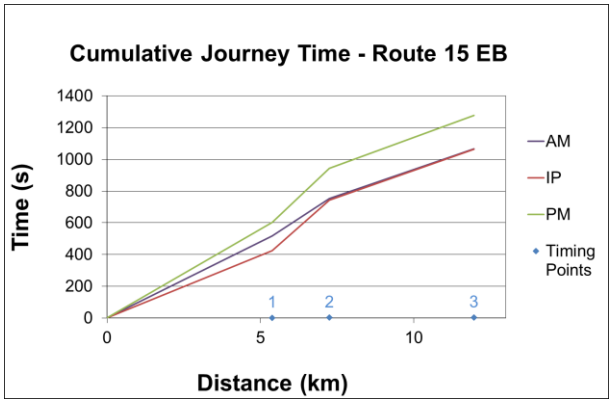

Cumulative Journey Time - Route 12 Clockclockwise
Time (s)
Distance (km)
AM
IP
PM
Timing Points

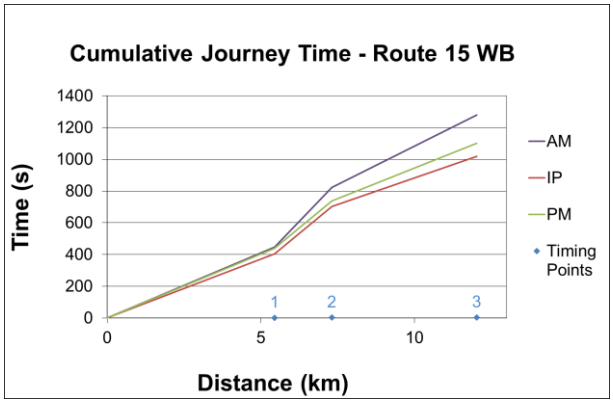

Cumulative Journey Time - Route 13 NB
Time (s)
Distance (km)
AM
IP
PM
Timing Points


Cumulative Journey Time - Route 13 SB
Time (s)
Distance (km)
AM
IP
PM
Timing Points


Cumulative Journey Time - Route 14 Anticlockwise
Time (s)
Distance (km)
AM
IP
PM
Timing Points


Cumulative Journey Time - Route 14 Clockclockwise
Time (s)
Distance (km)
AM
IP
PM
Timing Points


Cumulative Journey Time - Route 15 EB
Time (s)
Distance (km)
AM
IP
PM
Timing Points


Cumulative Journey Time - Route 15 WB
Time (s)
Distance (km)
AM
IP
PM
Timing Points